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CHAMBERS'S NEW AMERICAN ENCYCLOPÆDIA.

TUNIS, a country of Africa, and one of the Barbary States, is bounded on the n. by the Mediterranean, on the w. by Algeria, on the s. by the Desert, and on the e. by Tripoli and the Mediterranean. Its greatest length from north to south is about 440 miles; its average breadth, 160; area, upwards of 45,000 sq. m.; pop., according to latest authorities, 2,000,000. T. is traversed by branches of the great Atlas range, which, in fact, has its proper termination here. The northern coast is rocky and steep, with numerous bays, of which the largest is the Gulf of Tunis; and two of its promontories, Capes Blanco (*Ras-el-Abid*) and Bou, are the most northern in Africa. The eastern coast, on the other hand, is flat, sandy, and infertile, like that of Tripoli, but has two large gulfs, Hammamet and Gabes (the *Syrte Minor* of antiquity). The southern part of T. belongs to the desert steppe known as Belud-el-Jerid. There is only one fresh-water lake of any consequence, that of Biserta or Densart, near the north coast. The brooks and torrents of T. either lose themselves in the sand, or find their way to the sea after a short course. None are navigable. The longest is the Mejerda (the *Bagradas* of the ancients), which flows in a generally north-easterly direction into the Gulf of Tunis. Other streams are the Ved-el-Milhanah and the Ved-el-Kebir. There are several mineral springs in the country. The climate of T. is fine, and the soil exceedingly fertile, so that, in spite of a very poor knowledge of agriculture, wheat, barley, maize, dhurra, pulse, olives, oranges, figs, grapes, pomegranates, almonds, and dates are abundantly produced. The culture of oil is more attended to, and is very lucrative. Great herds of cattle are fed on the plains; the sheep are famous for their wool; and the horses and dromedaries are no less celebrated. The chief mineral products are sea-salt, sulphur, lead-ore, and quicksilver. In the vicinity of the sea-coasts, considerable manufacturing and trading industry is manifested, more particularly in the cities of Tunis and Suen. Wool, olive-oil, wax, honey, soap, hides, coral, sponges, dates, wheat, and barley are the principal exports. Cloth, leather, silks, muslins, spices, cochineal, and arms are transported by caravans to the interior of Africa, whence are brought for export to Europe, &c., senna, gums, ostrich-feathers, gold, and ivory. In 1876 the exports were of the value of £687,680; the imports, £473,660.

The predominant race is of Arabic descent, but there are many Berbers, especially in the interior. The territory of T. corresponds pretty nearly with that of ancient Carthage; and for a sketch of its pre-Christian history the reader is referred to the articles CARTHAGE, ROME, HANNIBAL, HAMILCAR, SCIPIO, JUGURTHA, &c. Its subsequent fortunes, down to 1575, are interwoven with the general fortunes of Barbary (q. v.); but in that year, Sinan Pasha conquered and incorporated it with the Ottoman Empire, and gave it a new constitution. The government was placed in the hands of a Turkish pasha, a divan or council, composed of the officers of the Turkish garrison, and the commander of the Janizaries. After a few years, however, an insurrection of the soldiery broke out, and a new government was established, the head of which was a "Dey," possessing very limited authority; the chief power being at first exercised by the military divan. Gradually, however, an officer with the title of "Bey," whose original functions were confined to the collection of tribute and taxes, acquired a supremacy over the other authorities, and finally obtained a kind of sovereignty, which Murad Bey succeeded in making hereditary. The family of Murad Bey ruled in T. for 100 years, and gained considerable renown both by their conquests on the mainland, and their piratical enterprises against Christian powers at sea. During the 18th c., it became tributary to Algiers. About the beginning of the 19th c., Hamuda Pasha threw off the Algerian yoke, subdued the Turkish militia, and created a native Tunisian army; in consequence of which T. virtually attained independence. The recent rulers, Achmet Bey (1857), Mohammed Bey (1855), and Mohammed Sadyk Bey (1859), have proved liberal, enlightened, and reforming sovereigns. By a firman of October 25, 1871, the sultan renounced the tribute formerly exacted, and fixed the future relations of the Sublime Porte to

Tunis
Tunnel

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Tunis. The "Bey" is to receive his investiture from Constantinople; without the sultan's authority, he can neither declare war, conclude peace, nor cede territory; the sultan's name must appear on all the coinage; the army must be at the disposal of the Porte. In internal matters, however, the power of the Bey remains absolute.

TUNIS, capital of the African state of the same name, lies on the west side of a small lake or lagoon, near the south-west extremity of the Lake of Tunis, about 8 miles from the ruins of ancient Carthage. It occupies rising ground, and both the city proper and the suburbs are surrounded by walls. The streets are narrow, unpaved, and dirty, but the bazaars are well furnished, and many of the mosques are really splendid, particularly the mosque of Jussuf, which has beautiful marble pillars. The palace of the bey is probably the finest building in T.; the ceilings glitter with gold, and carminc, and azure. All the principal rooms open into a large courtyard paved with marble, and surrounded by arcades supported on marble columns, while fountains everywhere diffuse a perpetual and delicious coolness. The citadel, begun by Charles V., and finished by Don John of Austria, is interesting from its collection of old arms, and was formerly the great slave-prison of Tunis. There are also Roman Catholic and Greek churches, Jews' synagogues, an Italian theatre, and large barracks in Tunis. T. is the commercial centre of the state. The imports in 1876 were £345,000, and exports £250,000. In the same year, 1024 vessels entered and cleared the port. T. has silk and woollen manufactures, as shawls, tapestries, mantles, burruses, caps, turbans, colored cloths, also leather, soap, wax, and olive oil, all of which it exports, together with grain, fruits, cattle, fish, ivory, gold-dust, coral, &c. Pop. stated at 130,000.

The lagoon or Lake of Tunis is shallow, and communicates with the *Gulf of Tunis*, an inlet of the Mediterranean, by a narrow strait called the Goletta. The gulf itself is 45 miles broad at the entrance—between Capo Bon and Capo Farina—and extends inland for 30 miles. The anchorage is good.

TUNKERS, a religious sect, occupying settlements in New England, New York, Pennsylvania, Ohio, Indiana, &c., and thus pretty widely scattered throughout the modern and middle parts of the United States. They are nowhere numerous, and are chiefly occupied in the cultivation of the soil. The name which they take for themselves is simply that of Brethren, and they profess that their association is founded on the principle of brotherly love. The name T. is of German origin, signifying Dippers, and is due to their dipping in baptism. It is very commonly, by corruption, pronounced and written *Dunkers*. In the vicinity of their settlements, they are generally known as the *Harmless People*. They derive their origin from a small village on the Eder in Germany, but have been an exclusively American sect since the beginning of last century, when they all emigrated to America. They were recently estimated to have over 500 churches, and some 50,000 members. They reject infant baptism, and have no ministers specially devoted to the ministry as a profession. Every brother is allowed to stand up in the congregation and exhort; and when one is found particularly apt to teach, he is ordained by laying on of hands with fasting and prayer, and is expected to devote himself in some measure to the ministry, although without any stipend or pecuniary reward, even if his own crops should suffer by his neglect of them. There are deaconesses as well as deacons among the Tunkers. Like the Quakers, they use great plainness of dress and language; they refuse to take oaths or to fight; and they will not go to law. They celebrate the Lord's Supper, and accompany it with love-feasts, washing of feet, the giving of the right hand of fellowship, and the kiss of charity. They anoint the sick with oil in order to their recovery, depending upon this unction and prayer, and rejecting the use of medicine. They generally believe in the doctrine of universal salvation; but it is not a tenet of the sect. They do not insist upon celibacy as an absolute rule; but they commend it as a virtue, and discourage marriage. They are industrious and honest, and universally held in good repute among their neighbors.

Sole dependence upon prayer for the cure of the sick is the characteristic also of a small religious sect, of which a few members are to be found in England, calling themselves the *Peculiar People*. In Switzerland, the name of Dorothea Trudel (d. 1862) was long famous for the cure of ailments by prayer. She did not, however, in all cases, refuse to call in medical advice. In Germany, a Protestant pastor, Blumhardt, pursues a similar system on a large scale, and it is said with great success.

TUNNEL. Tunnels are passages constructed under ground to carry roads, railways, canals, or streams of water. Tunnelling, which has long been in use for roads and aqueducts, has of late received a great development in the construction of railways. At the present time, there are believed to be upwards of 80 miles of railway tunnels in Great Britain in constant use for the passage of trains; and as their cost averages from £45 to £80 per yard, a total of about seven millions sterling has been expended in their construction. In tunnels of considerable length, as the progress made by working from the two ends would be very slow, it is considered advisable to commence the work from many points of its length; for this purpose, shafts or pits are made at these points down to the level of the tunnel. Of these shafts, some are temporary, and only kept open during the progress of the work; others are permanent, and for the purpose of ventilating the tunnel when in use. These shafts have to be large enough to allow the ascending and descending skips or buckets containing the excavated materials to pass one another. For the temporary shafts, an elliptical shape is found to give the greatest room for this purpose at the least expense. Square shafts are to be avoided, on account of the difficulty of excavating the corners in rocky strata. As the shaft descends, its sides are lined with timber-planks, supported by strong timber-frames, about five feet apart. The permanent shafts, when the material is not of rock sufficiently solid, are lined with brick-work or masonry, built in lengths, as the shaft proceeds downwards. These permanent shafts are generally made circular in section, and it is found better to place them three or four yards from the side of the tunnel, communicating with it by a small passage. This is convenient in the construction, and also is a useful refuge for workmen subsequently during the passage of trains. These shafts are generally made about ten feet diameter. They are sunk a few feet below the floor of the tunnel, to form a pit for the collection of the water from the workings, which is hauled to the top in barrels or buckets. The raising of the excavations and the water, and the lowering of building materials, and of the workmen, is done by a windlass, a horse-gin, or steam-power, according to the extent of the work. On the completion of the shaft, the tunnel is commenced in both directions from its bottom; and in the case of ordinary rock, it is found convenient to commence by making a small adit, or passage, along from shaft to shaft, through the whole length of the tunnel; this is made six or seven feet high, and the top of it placed at the level of the top of the tunnel. When this is completed, the correct centre line is marked out in it throughout the tunnel; the adit is then enlarged to the shape and size of the arch of the tunnel, which is built in, and then the excavation is completed, and side-walls built up to underpin the arch. In cases where the material is soft and full of water, the full section of the tunnel is generally carried forward at once, and in such cases an invert has to be built between the side-walls, to withstand the upward pressure, as the pressure of soft material has the character of a fluid pressure, and presses the tunnel on all sides. The excavation is then done in lengths of about 24 feet, which is firmly secured with poling-boards and larch bars, and securely shored; the centres are then set, and the brick-work built up. The timber bars are generally drawn out when the brick-work is carried up, and the holes they leave rammed tight with clay; but they have sometimes to be built in. When the quantity of water is very great, an adit is driven through the tunnel, at the level of its floor, before the work is begun, to allow the water to run off.

Tunnels are generally made straight, but sometimes they are curved; this is done that they may pass under the lowest part of the hill, in order that the shafts may be as short as possible. They are frequently constructed on steep gradients, but as the trains experience some resistance from the air in passing through them, it is advisable not to make them so steep as the gradients in the open air.

The most remarkable tunnel yet executed is the Mont Cenis* tunnel. This tunnel connects the railways of France and Italy, and is on the direct railway route from Paris to Turin. The length of this tunnel is 7 miles $4\frac{1}{2}$ furlongs. It is 484 feet higher at Bardonnèche, on the Italian side, than at Modane, on the French side.

* This is really a misnomer; the tunnel is at a considerable distance from Mont Cenis, and the chief summit under which it passes is the "Grand Vallon" (11,000 feet high).

Tunny
Turanian

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On this account, it is on a gradient of 1 in 45½ from Modane to the middle, and thence it falls 1 in 2000 to Bardonnèche, this latter fall being sufficient to run off the water. The dimensions at Modane are 26 feet 8½ inches wide at base, 26 feet 2½ inches at widest part, and 24 feet 7 inches high, the arch being nearly semicircular. At Bardonnèche, it is 11½ inches higher. It is all lined with stone-masonry, except at the Bardonnèche end, where the arch is of brick.

The work was begun in 1857, and was at first done in the usual way by hand; but in 1861, the perforating machines described below were introduced on the Italian side, and two years later (1863) on the French side. On the 30th June 1863, the tunnel had been driven 2800 yards, and the rate of advancement was 9½ feet per day. All the efforts of the engineers to accelerate the work were for several years unavailing; and in October 1866, just one-half the distance, or 6680 yards had been pierced, shewing the same constant rate of 9½ feet per day. At this rate, the tunnel would not have been completed till 1872. Owing, however, to improved modes of working, and to a favorable change in the nature of the rock, the rate of advancement became greater towards the end, and the two parties met on the 25th December 1870. The tunnel was formally opened in September 1871. A premium was to be paid by the French government to the Italian government, who did the work, for each year by which a term of 25 years, counting from 1862, was reduced. The French government were also to pay £1,287,000 for the construction of one-half the tunnel when completed.

This great work, which appeared almost impracticable to ordinary methods of tunnelling by manual labor, was rendered practicable by machinery introduced by the engineers, Messrs Sommeiller, Graudis, and Grattoni. The great difficulty lay in the fact that, from the great height of the mountain, shafts were impracticable, and progress could only be made from each end. The ventilation also presented serious difficulties. M. Sommeiller perfected a small machine, weighing 6 cwt., which bored a hole 1½ inch diameter and 3 feet deep in twenty minutes; the time taken by two miners working by the ordinary method being two hours. Eleven of these machines were placed on a movable support, and were capable of working at almost any angle. Three or four large holes were bored in the centre of the heading, and round these other holes of the ordinary size, in all 60 holes. The large holes were not fired, but were for the purpose of weakening the rock. The others were then fired in succession and in detachments, beginning with those nearest the centre, and working outwards. The machines were worked by compressed air, acting, like high-pressure steam, on a piston in a cylinder; this air being compressed outside the tunnel by water-power acting on the hydraulic-ram principle, and also by an air-pump; it was used at a pressure of five atmospheres above the atmospheric pressure, and was conveyed to the workings by a pipe 7 5-8 inches diameter. After it had expended itself in working the borers, it escaped into the tunnel and so ventilated the workings. The advanced heading was the only place where these machines were used; the enlargement of the tunnel to the full size, the building, &c., were all performed by manual labor. It was calculated that when the tunnel was completed there would be a constant current of air from the north to the south end, as the latter is the higher end, and in a situation more exposed to the heat of the sun. In view of the great importance of the Mont Cenis route, and the uncertainty of the time of completion of the tunnel, a locomotive railway was constructed in the meantime over the top of the pass. The rails were laid on the existing road, and ascended the hill in zigzag lines. The steepest gradient was 1 in 12, and on this gradient, and down to 1 in 20, a third rail was laid in the centre of the way, raised about 9 inches above the other rails. The engines were provided with two pairs of horizontal wheels, which being made to press against the centre rail, provided the adhesion necessary for ascending and descending these steep inclines. A similar enterprise to the piercing of Mont Cenis has been begun in connection with the new railway by the St Gotthard.

TUNNY (*Thynnus vulgaris*), a fish of the family *Scomberidae* (q. v.), found in the Mediterranean and in the Atlantic Ocean, but particularly abundant in the Mediterranean, where the T. fishery is of great importance. It occasionally, but rarely, occurs on the British coasts. The genus *Thynnus* is closely allied to *Scomber* (see MACKEREL), but has the dorsal fins close together, the detached finlets more numerous. The T. is a very large fish, sometimes nine feet in length, and weighing 1000

lbs., or even more. Its form is much thicker than that of the mackerel; its tail so widely forked as to be crescent-shaped. It is very plentiful near Constantinople, where it appears in shoals, sometimes so crowded that it may even be taken with the hand. The chief T. fisheries of the present day, however, are on the coasts of Spain, Italy, and Sardinia. The Phœnicians established a T. fishery at a very early period on the coast of Spain, and the T. appears on Phœnician medals of Cadiz and Carthage. Salted T. was much esteemed by the Romans, and was called *Saltamentum Sardicum*. The T. is generally captured by means of nets arranged in a funnel-like form, the fish entering the wide mouth of the funnel, and being gradually driven to the narrow end, where they are killed by lances and harpoons. The line of nets is often more than a quarter of a mile long, and costs about 6000 dollars.—The AMERICAN T. (*Thynnus secundo-dorsalis*) is found on the coasts of New York, and thence northwards to Nova Scotia. It sometimes attains a length of twelve feet. It is nearly black above, silvery on the sides, and white below. Its flesh is much esteemed. It also yields much oil, which is obtained by boiling the head and the belly. Twenty gallons of oil are often obtained from a single fish.

To the same genus with the T. belong the Bonito (q. v.) and the Albacore or Albicore (*T. albacorus*), which inhabits the West Indian seas, and is esteemed for the table. The name Albacore, however, seems to be often given to different species of this family, inhabiting tropical seas, and sometimes to the T. itself.

TUNSTALL, a prosperous market-town of England, in the county of Stafford. Pop. (1871) 13,540.

TUPAIA. See **BANRING**.

TUPELO (*Nyssa*), a genus of trees of the natural order *Alangiaceæ*, natives of North America, chiefly of the southern parts of the United States; having simple alternate leaves, mostly entire, greenish inconspicuous flowers at the extremity of long stalks, the fruit a drupe. *N. villosa* attains a height of 60–70 feet. It is often called **BLACK GUM TREE**. *N. tomentosa*, the **LARGE T.**, is a lofty and beautiful tree, remarkable for the extraordinary enlargement of the base of the trunk, which is sometimes eight or nine feet in diameter, whilst at no great height the diameter diminishes to fifteen or twenty inches. The fruit resembles a small olive, and is preserved in the same way by the French settlers in America. *N. candicans* or *capitata*, the **OGEECHEE LINE or SOUR GUM TREE**, is a small tree, of which the fruit is very acid, and is used like that of the lime. The wood of all the species is soft, that of the Large T. remarkably so.

TUPPER, Martin Farquhar, D.C.L., F.R.S., a poet rather popular than great, was born on 17th July 1810. His father, Martin Tupper, was a well-known London surgeon, of a family originally German, which had long been settled in Guernsey. Martin T. was educated at the Charter-house, and afterwards at Christchurch, Oxford. On leaving college, he entered himself as a student at Lincoln's Inn, and was called to the bar in 1835; but literature had more charms for him than the law, which he never seriously prosecuted. In 1832, he published anonymously a small volume of poems, which attracted little attention. For this lack of success, he was, however, amply repaid on the appearance, in 1839, of his "Proverbial Philosophy." The popularity of this work in England, and still more in America, has ever since been immense, and almost unprecedented. The critics have indeed been less kind to it than the reading public; and the fame of Mr T. has long been a topic of mirth to the wits of the literary guild; but from the serene height of his fortieth edition an author can perhaps afford to smile at the attacks of the envious generation below. A fair criticism would probably adjudge that, while there is nothing in Mr T.'s "Proverbial Philosophy" to justify its enormous success—so far as mere circulation is success—the book is yet something better than the mere conglomeration of stupid platitudes, which its detractors so confidently proclaim it to be. Besides this work, on which his reputation—such as it may be—rests, Mr T. has published "The Crock of Gold," a tale; "Geraldine," a sufficiently ludicrous attempt to complete Coleridge's inimitable fragment "Christabel;" with various other works in prose and verse, which it is quite unnecessary to enumerate, inasmuch as no one of them has succeeded in making the least impression on the public.

TURANIAN LANGUAGES. In opposition to *Iran*, the name of their own

Turbary
Tureanne

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country, the Persians from the earliest times called the countries lying to the north of it Turan, and this name is still frequently used as synonymous with Turkestan. The term Turanian derived from it has been adopted by philologists, in contrast with Aryan (q. v.), to designate a family of languages comprising "all languages spoken in Asia and Europe (including Oceania), and not included under the Aryan and Semitic families, with the exception of Chinese and its cognate dialects." The languages of this family are of the agglutinate order (see PHILOLOGY). Max Müller classes them in two great divisions, the Northern and the Southern. The Northern division falls into five sections—the *Tungusic*, *Mongolic*, *Turkic*, *Finnic*, and *Samoyedic*. Of these, the Tungusic dialects, which extend north and west from China, are the lowest in organisation, being, some of them, nearly as destitute of grammatical forms as the Chinese. The Mongolic dialects are superior to the Tungusic, although the different parts of speech are hardly distinguished; both branches, however, are believed to be manifesting symptoms of grammatical development. The Turkic dialects, of which the Osmanli or Turkish of Constantinople is the most prominent, occupy an immense area, extending from the Lena and the Polar Sea to the Adriatic. They are extremely rich in grammatical forms, especially in the conjugation of the verb. The most important members of the Finnic class are the Finnic of the Baltic coasts (see FINNS), and the Hungarian language, or Magyar (see HUNGARY). These dialects have also a fully developed grammatical structure, and in point of declension are even richer than the Turkic.

The Southern division comprises, among others, the *Tamulic* or Dravidian dialects of southern Indian (see TAMIL); the *Gangetic* group divided into two branches, the Trans-Himalayan (Tibetan, q. v.) and Sub-Himalayan (Bhotanese, &c.); the *Taic*, or the dialects of Siam; and the *Malaic*, or Malay and Polynesian dialects. The Turanian languages do not present the same unmistakable family likeness, the same clear evidences of genealogical relationship, as are presented by the Aryan and Semitic groups. The nature of their structure, and the nomadic character of the peoples speaking them, are sufficient to account for their exceeding diversity, even supposing them to have all sprung from the same original stock. "The only characteristic Turanian feature which always remains in this: the root is never obscured. Besides this, the determining or modifying syllables are generally placed at the end, and the vowels do not become so absolutely fixed for each syllable as in Sanscrit and Hebrew. On the contrary, there is what is called the Law of Harmony, according to which the vowels of each word may be changed and modulated so as to harmonise with the key-note struck by its chief vowel. The vowels in Turkish, for instance, are divided into two classes, *sharp* and *flat*. If a verb contains a sharp vowel in its radical portion, the vowels of the terminations are all sharp; while the same terminations, if following a root with a flat vowel, modulate their own vowels into the flat key. Thus, we have *sev-mek*, to love, but *bak-mak*, to regard, *mek* or *mak* being the termination of the infinitive. Thus, we say, *so-ler*, the houses, but *at-lar*, the horses, *ler* or *lar* being the termination of the plural."—Max Müller's "Science of Language," 1st series.

TURBARY, in the Law of England, is a right to go upon the soil of another and dig turf, and carry away the same. It is classed under the head of a *Profit à Prendre*, and is generally traced to some ancient custom of a manor, or is proved by prescription, or long use for thirty years and upwards.

TURBINE. See WATER-POWER.

TURBIDINÆ, a family of gasteropodous molluscs, having a spiral shell, with a narrow entire aperture. The species are numerous; some of them are found on the British coasts. They are numerous and widely distributed. Some are large, others small; some are very beautiful. The beautiful pheasant-shells (*Phasianella*) of the South Seas are referred to this family.

TURBOT (*Rhombus maximus*), a fish of the family *Pleuronectidae*, or Flat-fishes, the most valuable of them all. The genus *Rhombus* has the body rhomboidal; the dorsal fin commencing immediately above the upper lip, and extending almost to the tail-fin; the eyes generally on the left side. The Brill (q. v.) belongs to it as well as the T., and some other less important fishes. The T. attains a large size, sometimes 70—90 lbs. weight. Its form is shorter, broader, and deeper than

that of almost any other flat-fish. It is of a brown color on the upper surface, which is studded with hard roundish tubercles. Like the other flat-fishes it generally keeps close to the bottom of the sea; and it is found chiefly on banks where there is a considerable depth of water. Some of the banks in the German Ocean abound in T.—as the Dogger Bank—and yield great quantities to the London market. The T., however, is also found, although more sparingly, in estuaries. In former times, it was chiefly caught by long lines; but of late, the greater part of the supply for the London market is obtained by beam-trawling (see *TRAWLING*). Few kinds of fish are more prized for the table than the turbot.—The AMERICAN or SPOTTED T. (*Rhombus maculatus*) is also highly esteemed for the table. It is common on the coasts of New England and New York. It attains a weight of 20 lbs. The breadth is about one-half of the length. The upper surface is smooth, reddish gray, with large circular or oblong darker blotches, and numerous white spots.

TURDIDÆ. See *MERULIDÆ*.

TURENNE, Henri de la Tour, d'Auvergne, Vicomte de, one of the most eminent of France's military heroes, was the second son of Henri, Duke of Bouillon, and Elizabeth of Nassau, the daughter of William I. of Nassau-Orange, the great assertor of the liberties of the Netherlands, and was born at Sedan, in the dep. of Ardennes, 11th September 1611. Brought up in the Reformed faith, he was sent, on the death of his father in 1623, to Holland, where, under his uncle, the celebrated Maurice (q. v.), he was initiated into the art of war. Returning to France in 1630, he was favorably received by Richelieu, who at once gave him a commission. In 1637, he was attached to the army of Bernard of Weimar, which at that time was engaged in Lorraine; and by bringing about the capture of Landrecies, Maubeuge, and other places, including the key of Western Germany, Brisach, gained such repute, that on his return to Paris (1638), he experienced quite a triumphal reception. The victories of Route and Casale in the Italian campaign of the following year, added to his laurels; and in 1641 he was for the first time intrusted with the supreme command. The rapid and thorough conquest of Roussillon from the Spaniards in 1642, was good proof of his masterly military genius, and was rewarded in 1643 with the baton of a marshal of France, and the chief command on the Rhine, where repeated reverses, a defective commissariat, and want of pay, had completely demoralised the army. But through a liberal expenditure of his own funds, and of loans obtained by him on his own security, the troops were speedily re-equipped; and by a victory over the Bavarians at Rottweil (1644), their morale was restored. Condé's arrival transferred him to a subordinate position; and his restoration to supreme command was followed by the commission of a glaring strategic error for which he was severely punished by his able and watchful opponent, Mercy, who completely routed him at Marienthal, 5th May 1645; but on August 3 of the same year, this disgrace was amply avenged by Condé at Nordlingen, where Mercy was slain; and T. gloriously concluded the war on the part of France by the reconquest of the Treves electorate, by the conquest of Bavaria in conjunction with the Swedes, and by a successful campaign in Flanders. In the civil wars of the Fronde (q. v.), which immediately followed, T. joined the party of the *frondeurs*, of whom his elder brother was one of the principal leaders; but after being defeated at Rethel (December 15, 1650), he withdrew to Flanders, returning on Mazarin's retirement. On the minister's return, T. joined his party, while Condé deserted to the *frondeurs*, and the two greatest generals of the period were for the first time pitted against each other. T. was uniformly victorious over his former chief, though his forces were inferior in number; and ultimately forced him to retire from France; after which he subdued the revolted cities, crossed the northern frontier, and conquered much of the Spanish Netherlands. In 1667, on the outbreak of war between France and Holland, Louis XIV. created T. Marshal-general of France, and would have made him Constable, had he not been a Protestant. Indeed, the unorthodoxy of T. had for some time been a matter of grave concern to the bigoted young monarch, at whose suggestion Bossuet attempted the veteran's conversion by composing his celebrated "Exposition de la Doctrine Chrétienne," which, backed by the king's repeated solicitations and remonstrances, and doubtless, as Voltaire suggests, by the more efficacious promptings of ambition, had ultimately the desired effect. T.'s campaign in Holland, in which he was nominally under Louis's command, was a

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most triumphant one; and the Elector of Brandenburg, who had ventured to side with the Dutch, was pursued to Berlin (1672), and forced to beg for peace. The emperor next took up arms on behalf of Holland, whereupon T. was transferred to the Upper Rhine. This, his last campaign, is foully disfigured by the horrible devastation of the Palatinate, executed under express orders, doubtless, but with a willing thoroughness which is utterly unjustifiable. After routing the Germans at Mulhausen and Turckheim, and forcing them across the Rhine, he was at last opposed to a worthy antagonist in Montecuculi (q. v.); but, unfortunately, their famous passage of strategy of nearly half a year's duration was left unfinished, T. being killed while reconnoitering the ground at Salzbach, with a view to a grand engagement. His grateful sovereign, to shew that he made no distinction *entre porter le sceptre, et le bien souvenir*, ordered him to be entombed at Saint Denis, and funeral orations were pronounced for him by Flechier and Mascarón. On the desecration of Saint Denis during the Revolution, T.'s monument suffered with the rest, and was ultimately placed by Napoleon under the dome of the Invalides. T. has left *Memoirs of his campaigns from 1643 to 1658*, which are of considerable interest to the student of history. Many biographies of this eminent warrior have been written, by Ragnenet, Ramsay, Bulson, D'Avrigny, &c.

TURF LAWS. The laws concerning the ancient pastime of horse-racing are subdivided into those affecting races, wagers, and betting-houses, for which last see **BETTING**. 1. As to racing, it has sometimes been popularly believed that the public have a right to trespass on lands to attend or to hold races; but no such right exists. Hence the stewards or persons intrusted with the management and possession of the land for the time have a right, which is seldom enforced, to turn off any person they please from the grounds. A sweepstakes is a stake or fund, for which at least three entrances must be made, and the whole stake becomes, under certain regulations, the property of the winner. Many of the great races are not run within a year from the time the horses are entered. The owner of a horse entered can withdraw or "scratch" him before the race is run. When the race is run, the successful party may sue for the amount of the stakes; and if the race is not run, or cannot be run, each subscriber may sue for recovery of his contribution; but no one can obtain his contribution, or countermand it, till the event has happened, for a sweepstakes is a legal contract to abide the result. If the stakes are contributed for an illegal game, it is otherwise; and before the stakes have been paid away, any contributor may sue for and recover his deposit; but he ought also formally to demand it back. The stewards are the proper parties to decide all disputes about the fairness of a race, and their award is binding: if they cannot agree, then it will fall to be decided by a jury. It is no legal objection to their award, that one of them is interested in the decision, for this is considered partly unavoidable, and within the knowledge of all parties as a probable event. If there are three stewards, the decision of the majority is binding.—2. As to wagers. It was not illegal at common law to enter into a wager, if the subject-matter was not injurious to morality or decency; and hence the bet could be recovered by action, and betting on a race is still legal to any extent. But by the act 8 and 9 Vict. c. 109, s. 15, all wagers were declared void, except as regards subscriptions of money or plate to be awarded to the winner of a lawful game, sport, pastime, or exercise. If one makes a wager on a race, he may retract it any time before the event comes off, and require the money, if deposited, to be repaid; and no wager can be tried in any court of law or equity, so that the winner cannot compel payment. It is merely a debt of honor.

TURGOT, Anne Robert Jacques, French statesman, born in Paris, May 10, 1728, was descended from one of the oldest families in Normandy. T. was destined for an ecclesiastical career, but adopted by preference the profession of law. In 1761, he was appointed Intendant of Limoges, and administered the affairs of the province for thirteen years. He introduced a more equitable administration of impost, and succeeded in abolishing the old method of repairing roads and bridges by the compulsory labor of the poor inhabitants of the district, called *corvées*. He also exerted himself in providing for the subsistence of the people and the protection of commerce. He introduced into the Limoges the cultivation of potatoes. A wider field opened before him on the death of Louis XV. The finances were in a terrible state of disorder, the whole social and political system of France needed

regeneration and reform; and T. appeared to be the man to meet the crisis. He was first made Minister of Marine, and afterwards Comptroller-general of France, when to fill that post was to be virtually the Prime Minister. In his letter to Louis XVI., he adopted, as the principle of his administration, that there should be "no bankruptcy, no augmentation of imposts, no loans;" yet he foresaw that the strength of the privileged classes, and the corrupt influence of those who profited by abuses, would be too much for him, and that against such enemies he could hardly hope to retain the confidence of the king. His first task was so far to reduce the expenditure as to leave a surplus of 20 millions of francs a year, to be applied to the liquidation of old debts. He augmented the public revenue without imposing new taxes, and he introduced exactness of payments and fidelity of engagements into all his financial operations. One of his first measures was the carrying out of free-trade in corn throughout the interior of the kingdom. He constantly occupied himself with the amelioration of the condition of the people. He proposed to enfranchise the rural districts from statuto labor, provinces from their barriers, commerce from internal duties, trade from its shackles, and, lastly, to make the nobility and clergy contribute to the taxes in the same proportion as the third estate. This great minister and virtuous citizen, of whom his colleague, Mallesherbes, said: "He has the head of Bacon, and the heart of L'Hopital," wished, by means of provincial assemblies, to accustom the nation to public life, and prepare it for the restoration of the States-general. If the nobility and privileged classes had possessed enough of foresight and patriotism to submit to his plans for reforming France, she might have been spared the horrors and excesses of the Revolution. But his projects for the public good were defeated by the confederacy formed against him by nobles, courtiers, farmers of the revenue, and financiers. The king forsook him, although, at the same time, observing that T. and himself were the only persons who desired the welfare of the people. He retired, having held office for only twenty months. It is alleged against his practical talent for statesmanship, that he labored under a want of address, and that he did not sufficiently dissemble his hatred and contempt for the cowardice and baseness of those who fattened upon the abuses that were eating like an ulcer into the heart of France. After his retirement, he resumed his early worship of the Muses. His Latin inscription for the portrait of Franklin is a line of which any author might be proud: "Eripuit cœlo fulmen, sceptrumque tyrannus." He also devoted himself to physics and mathematics. His works are a mine of sound and original thought. His "Mémoire" on the American war expresses views on the nature of colonies which have since been adopted by the best writers. His work on "Usury" contains almost all that is of value in Bentham's "Letters on the Usury Laws." He held general objections to charitable institutions. He died of gout, March 20, 1781, leaving behind him a memory which France will ever cherish with veneration.

TURIN (*Augusta Taurinorum, Bodincornagus, Colonia Julia, Taurasia*—in Italian, *Torino*), a city of Northern Italy, formerly capital of Piedmont, then of the kingdom of Italy, is situated near the confluence of the Po and the Dora Ripaira, 45° 5' n. lat., 7° 42' e. long. Its pop. at the beginning of this century was 42,000—in 1843, it was 235,000; now that it is no longer the capital, it is reduced to (1872) 207,770. It began to acquire importance when Amadeus V. declared it the capital of Savoy in 1418, built a castle there, and made it his residence. In 1620, Charles Emmanuel I. enlarged the city by royal decree; it was still more enlarged in 1673 and in 1702. At the beginning of this century, the French destroyed and levelled the ramparts of the town, converting them into public promenades. Of late years, the moats and fortifications have been demolished, to make way for new streets towards Porta-Susa. In consequence of these improvements, T. has become one of the handsomest cities in Europe. It is famed for its handsome squares. Some of the finest are—Piazza San Carlo, surrounded by wide porticoes, and adorned by a fine equestrian statue of Emanuel Philibert of Savoy, by Marochetti; Piazza Castello, also surrounded by porticoes, which are prolonged down Via Po to the end of Piazza Vittorio Emanuele, the finest square in Europe for size, regularity of architecture, and beauty of situation; Piazza Carlo Felice, with porticoes and a fine garden; Piazza Carlo Alberto, with an equestrian statue of the king of that name, by Marochetti; Piazza d'Armi, a vast open space for military exercises, flanked by the old

and new arsenals of the kingdom. Leading out of Piazza Vittorio Emanuele, there is a handsome five-arched bridge across the Po, begun by Napoleon I., with money got by the sale of the jewels and votive offerings of the cathedral, and finished by the kings of Sardinia. Another fine bridge is that across the Dora, of one single arch, nearly straight, the work of the engineer Mosca. Among the numerous churches, the principal are the cathedral of San Giovanni, a Gothic structure, built in the 11th c., and reconstructed in 1498; San Filippo, the handsomest church in T.; La Consolata; La Gran Madre di Dio; and a Waldensian temple. On the summit of a hill near the town is La Superga, a splendid Basilica, raised by Victor Amadeus to fulfil a vow, and now the mausoleum of the House of Savoy. Among the "palaces," must be noticed the royal palace, designed by Castelmonte, which is poor in outward appearance; the Carignano Palace, an odd building, by Guarini; the town-hall, designed by Lanfranchi; the university, with 71 professorships and about 900 students, a library of 120,000 vols., and 2000 MSS.; the Accademia delle Scienze, with an Egyptian museum, the finest in Europe; the Seminary; the Hospital of San Giovanni. The private palaces are numerous and vast, but in a bad style of architecture. There is the Theatre Royal; the Carignano Theatre, designed by Alfieri; the Vittorio Emanuele, and many other theatres.

The manufactures of T. consist of woollen and silk fabrics, velvet hats, paper, pottery, leather, arms, and liqueurs. The population is sober, industrious, and generally well off.

T. was originally inhabited by the Taurinians, a tribe of Ligurians. It is first mentioned in history in the time of Hannibal, by whom it was taken and sacked, on his descent into Italy after crossing the Alps. T. became a royal colony, 166 B.C., and was called by Augustus, *Augusta Taurinorum*. On the fall of the Empire, it went to the Lombards, and became the capital of one of the 30 Lombard duchies. Charlemagne made it the residence of the Duke of Susa, whose line ruled till 1032, when the House of Savoy succeeded it. It was taken by the French in 1566, and held by them for nearly 60 years. They again took it in 1640; and in 1796, it was dismantled, and united to the French Empire in 1800 with the name of the department of the Po. In 1815, it was restored to the House of Savoy.

TURKESTAN, "the country of the Turks," called also *Jagatai*, and by the Persians *Turan*, is an extensive region of Central Asia, stretching from the Caspian Sea eastward to beyond Lob-nor (long. 110° e.), and from Siberia and Dzungaria southward to Persia, Afghanistan, and Tibet. Until quite recently, it was supposed that the Bolor Tagh (q. v.), a mountain chain of the first magnitude, running north and south, divided it into two parts. English explorers entering T. from the south, and Russians from the north, have shewn that no such range exists. Its place is taken so far, however, by a lofty table-land, the Pamir Steppe, which, sloping gently toward the east and west, separates the rivers running eastward to the desert of Gobi from those which run to the Sea of Aral. It separates T. into a western and an eastern portion.

WESTERN TURKESTAN, *Great Bukharia*, or simply *Turkestan*, or *Turan*, consists of the great hollow plain of the Caspian and Aral Seas, which occupies its west and centre, and of the hilly and well-watered districts formed by the ramifications of the Thian-shan Mountains and Hindu Kush. The plain is composed of deserts of loose shifting sand, interspersed with oases where a subsoil of clay renders the formation of lakelets of rain possible; strips of fertile land along the banks of rivers, and occasional tracts clad with coarse thin grass; the eastern districts abound in valleys of remarkable fertility. The climate varies on the plains from extreme cold to burning heat, and though, in the eastern highlands, the cold is almost as intense in winter, the heat of summer is much less. The rivers of T. are the Sir-Daria (see JAXARTES) and Amu-Daria (see OXUS); the Zer-Afshan, which rises on the south of the Asfera-tag, and flows westward for 400 miles, terminating in a small salt lake or marsh near Bokhara; and the Murghab, which rises in the mountains of Ghur, and after a west-north-west course of 450 miles, loses itself in a marsh beyond Merv. The vegetable products of the country are fruit, grain, cotton, flax, hemp, and tobacco. Silk is also produced in considerable amount. Forests can hardly be said to be at all represented in this extensive region. Salt is abundant, large tracts of desert being strongly impregnated and even crusted over with it; and sal ammoniac is common. Agriculture, and the breeding of the domestic animals,

are the occupations of the great mass of the population; but manufacturing industry is also considerable. The produce consists of cotton, silk, linen, and woollen goods, shagreen (superior to that manufactured in Europe) and other kinds of leather, paper made of raw silk, carpets, and a few sabres, knives, and rifles.

T. is divided into Khokan (q. v.), now the Russian province of Ferghana, in the northeast; Khiva (q. v.), part of which is now Russian territory, in the west; Bokhara (q. v.), in the east and centre; Kunduz or Badakshan (q. v.) and Balkh (q. v.) in the south-east; and the tracts lying north of the Persian frontier. The population of Western Turkestan has been estimated at four millions. It consists of various races—Uzbeks (q. v.), the dominant race, Turkomans, Karakalpaks, Kirghis (q. v.), Sarts or Tajiks, Persians, Kiptchaks, and a few Arabs, Hindus, and Jews. Of these, the Sarts or Tajiks, the original inhabitants of the cities, are of ancient Persian stock, and along with the Uzbeks, Hindus, and Jews, form the settled population; the Persians are either slaves, or, being introduced into T. as such, have obtained their freedom, and settled in the country; the other races are mostly nomad and predatory. The prevalent religion is Mohammedanism, and most of the tribes are Sunnites. A few Shieahs, Sufis, and Buddhists are also found.

T. has played an important part in Asiatic history from the very earliest times. The contests between the Iranian and Turanian races occupy a prominent place in Herodotus's sketch of the semi-mythical traditions of Persia; and the earliest light of history shews us Bactriana (Balkh) and Sogdiana (Bokhara) as well cultivated and populous countries, generally attached to the Persian empire, and inhabited by Persians, to whom most of the prominent cities of T. owe their origin. With Persia, T. passed into the hands of the Macedonians, who made Bactria an independent Greek kingdom, while the rest was in possession of the Parthians. Under the Sassanides, the Persian boundary was again advanced to the Jaxartes; but the gradual gathering of Turkish tribes from the north-east on the right bank of that river, led to a constant state of warfare on the frontier, which ultimately resulted in the occupation of *Mawer-ul-neher* ("the country between the rivers"—i. e., the Oxus and Jaxartes) and of Khwarezm (Khiva) by the invaders. In the 8th c. of the Christian era, the Arabs possessed themselves of T., and during the decline of the califate, it became the seat of various minor dynasties, as the Samani (q. v.) in *Mawer-ul-neher*, and the shahs of Khwarezm; and after a brief union with the Seljuk empire in Persia, was mostly united to Khwarezm, and along with it overrun by the Mongol hordes under Genghis Khan (q. v.), on whose death it became one of the four divisions of his vast empire, and was allotted to his son Jagatai. On the decline of Jagatai's dynasty, Timur (q. v.) rose to supreme authority in T., and in the course of a 35 years' reign, made it the centre of an immense empire, which stretched from the Hellespont to the frontiers of China, and from Moscow to the Ganges. This period was the golden age of T.; its powerful monarch was never weary of adorning his cities with the spoils of victory; colonies of learned men, skilled artisans, and all whose knowledge or abilities could be of service to his subjects, were either transferred to T. from the countries he had conquered, or induced by the most munificent offers to settle there; till under him and his more immediate successors, Samarkand became a focus of enlightenment and learning. But after the death of Shah Rokh, Timur's youngest son, the empire was split up into numerous fragments; and after a time a new dynasty snatched Persia from Timur's family, while the Uzbeks, under Sheibani Khan, drove them (1600) from the country north of the Amu-Daria: one of the expelled princes, Mirza Baber, who had ruled in Ferghana (the south half of Khokan), subsequently founding the "Great Mogul" empire in Hindustan. The Uzbek empire generally included Badakshan, Herat, and Meshed; but these were lost on its division, in 1658, into various independent khanates. Khiva was conquered by Nadir Shah in 1740, and Bokhara limited to the north bank of the Amu-Daria; but the Kirghis of the Little Horde restored the independence of Khiva, which they ruled till 1793, when the present Uzbek dynasty obtained the throne; and Shah Murad (1806—1822), celebrated under the appellation of *Begges Jan*, effectually re-established its former extensive sway to the Bokhariot sceptre. Khokan, after emancipating itself from the authority of Sheibani's successors, was incorporated with Bokhara; but afterwards united with the states of Eastern T., and on their conquest by China, resumed its inde-

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pendence. The recent history of T. records a series of wars between Bokhara and Kuokan, and Bokhara and Khiva, in which the Bokhariots had generally the advantage, owing to the aid of the Turkomans of the southern desert, whom they subelidise; the raids of the Turkomans along the northern frontier of Persia; the advance of the Afghans from the south-east; and the progress of Russian conquest from the north and west. To explain the Turkoman raids, a few additional words on the geography of T. are necessary. Between the deserts of T. and those of Persia lies a long and fertile tract running from the south-east of the Caspian to Herat, the "key to India;" over it pass the great routes from Western to Eastern Asia. North of it, chiefly in the deserts, dwell the Turkomans, a population of one million of savage brigands and man-stealers, constantly engaged in marauding expeditions against the Northern Persians. They have desolated the frontier, and the atrocities they commit far exceed anything recorded of the African slave-trade. In 1860, Hauza Mirza, an uncle of the present shah, marched against them, but was defeated in attempting to capture their intrenchments in a marsh. On that occasion, 18,000 Persians and 80 guns were taken by the Turkomans. In 1865, a more successful expedition proceeded against Saraks, and the guns were recovered. Still the northern routes are in the hands of the Turkomans, more especially that leading by the Daman-i-koh Hills; and so late as 1873, reports appeared of Turkoman raids in Northern Persia. The south-eastern part of T. has also been the scene of recent strife. The Afghans have invaded it for the recovery of possessions they claimed north of the Hindu-Kush. In 1850, they took Balkh and Kaniun, and in 1859, Kunduz, Badakshan at the same time submitting to pay a large tribute. The English and Russian governments seem now to recognise the claim of the Afghans to fix their frontier at the Oxus (see debate in House of Commons, 2nd April 1873). The Russians bid fair soon to absorb all that remains of independent Turkestan. In 1864, they invaded Khokan, and took Tashkend and Khokan. A struggle followed with Bokhara. On the 20th May 1866 was fought the battle of Irjar, the most important event in the recent history of Turkestan. The emir had to flee for his life, leaving his camp in the hands of the enemy. In 1868, the Russians, 8000 men, again advanced and crossed the river of Samarkand. The troops of the emir, 40,000 men, took to flight when they saw the Russians approach with their dreaded artillery, and on 14th June a treaty was concluded, by which Bokhara transferred to Russia Samarkand and all the territory north and east of it. Khiva still remained independent in the midst of its deserts. But early in 1873 an expedition in four divisions set out from the Russian frontier posts against Khiva, which fell in June of that year, after no great resistance. A great part of Khivan territory north of the Amu-Daria was ceded to the conquerors; and after a fierce struggle in 1875 and 1876 with the warlike inhabitants of Khokan, which is now the Russian province of Ferghana, Russia formally annexed the whole. The news of the fall of Khiva was welcomed in this country as a triumph of civilisation over barbarism; but the further annexation of Khokan provoked the fear that Russia will go on to annex other territories now in the hands of the Turkomans, including the northern route to Herat; that she will convert the Turkomans into a great army of horsemen, under European officers, the most formidable in the world, and prepare for further conquests, threatening alike our commerce and influence in the East.—See "A Journey to the Source of the Oxus," by J. Wood (1872); "History of Bokhara," by A. Vambery (1873); "Quarterly Review," April 1873; and several articles in the "Geographical Magazine" of 1876.

EASTERN TURKESTAN, known also as *Upper Tartary*, *Chinese Turkestan*, *Little Bukharia*, and *Turfan*, is bounded on the north by the Thian-shan Mountains, on the west by the Pamir table-land, and on the south by the highlands of Tibet or Cashmere. Towards the east it sinks to the desert plain of the Gobi, round the western bay of which it forms a vast crescent-shaped oasis from 4000 to 5000 feet in elevation, drained by the tributaries of the Tarim. This river flows eastward to the desert, and empties itself in the Lob-nor, after a course of 1500 miles. Eastern T. formed till recently a province of China, and its inaccessible position prevented us from obtaining much information concerning it. Mr Robert Shaw was the first Englishman who entered the country, and, from his enthusiastic account of its capabilities as a field for English commerce, it has recently attracted much attention. It is dependent for its fertility on irrigation. The canals ramify over the whole country, sometimes crossing each other at three levels. The plains are covered with corn-

fields and orchards. So numerous are the latter, that, at the distance of a few hundred yards, the whole country seems covered with a wood. In all directions are villages and towns, where weekly markets are held, and there are several cities with upwards of 100,000 inhabitants. The political capital is Kashgar; the commercial capital, Yarkand. In the latter, there are 60 colleges, with endowments for the education of students in Mussulman law. There is security for life and property, and commerce is protected and encouraged. There is a great demand for English goods, and for the teas produced in India, which, it is believed, can be supplied more cheaply from our own frontier than from that of Russia. Mr Shaw, in a letter which appeared in the "Times" of the 25th January 1873, shewed that there is no difficulty about a return trade, as the gold-fields of Khoten are productive, and the whole country produces silk in abundance, at a time when our supply in all other quarters has been diminished by the disease. The inhabitants speak Turkish, but are said to be of Persian descent. Little is known of Eastern T. previous to its conquest by Genghis Khan; but after the decay of his empire into petty states, among which are Kashgar, Yarkand, Aken, and Khoten, the chiefs of these were constantly quarrelling with each other—a temporary peace being occasionally produced by their subjection to some powerful neighbor—till several of the leaders, with the Yarkand prince at their head, invited the Chinese to take possession of the country, and in 1758 it became a province of China. In 1864, however, a mutiny among the Chinese troops induced the dispossessed native chiefs to stir up a Mohammedan insurrection. They invited a Khokan prince, Buzurg Khan, to assume the government. Through his lieutenant Yakoub Beg, he dispersed the Chinese garrison left to defend the fort of Kashgar. But the lieutenant soon superseded him, and became sole Emir under the title of Athalik Ghazi. He possessed civil as well as military capacity, and raised the country to a state of considerable prosperity. He sent an envoy to Calcutta in 1872, and in 1873 Sir T. D. Forsyth visited Kashgar from the Indian government. But the Emir's position did not secure more intimate relations. He had since 1869 successfully resisted the encroachments of Russia, but in 1876 the Chinese again advanced, defeated him, and retook their old province in 1877. The Emir died shortly after. See "Journey to High Tartary," &c., by R. B. Shaw, 1871; "Report of Mission to Kashgar," by Sir T. D. Forsyth, 1875; "Kashmir and Kashgar," by Dr Bellew, 1876.

TURKEY, or the Ottoman Empire (q. v.), includes large portions of the continents of Europe, Asia, and Africa, and consists of Turkey Proper, which is under the direct rule of the sultan, and of several dependent and tributary states. The arrangements sanctioned by the Berlin Congress in 1878 have largely changed the size and organisation of the empire. It will be some time before Turkish affairs settle again into equilibrium, and reliable statistical results of the formally sanctioned reorganisation cannot immediately be expected. In any case, it is necessary for an understanding of Turkey as it now is, to begin with Turkey as it was before the last momentous war with Russia.

The "Almanach de Götting" of 1878 gave the following estimates of the area and population of the Turkish empire before the sweeping changes agreed to at Berlin:

I. Immediate Possessions—		Sq. Miles.	Population.
In Europe.....		139,824	9,400,864
In Asia and Africa.....		1,083,673	18,079,112
District of Constantinople.....			1,400,000
Nomadic Races.....			2,000,000
Army and Police.....			560,262
Foreign Residents in Turkey.....			500,000
		1,223,497	31,939,739
II. Protectorates—			
In Europe { Roumania.....	46,617	5,073,000	
{ Servia.....	14,549	1,267,000	
In Africa { Egypt.....	866,012	17,600,000	
{ Tunis.....	45,588	2,000,000	
III. Tributary Principality of Samos.....		212	85,678
		972,928	25,475,878
Turkish Empire.....		2,196,425	57,415,616

Montenegro, formerly a tributary state, had been virtually independent for many years.

The population of the various provinces, even of European Turkey, has always been difficult to ascertain. The most satisfactory estimate was probably one made before the vilayet of Herzegovina was separated from Bosnia, and published in 1876 in the Vienna journal, "*Monatsschrift für den Orient*." This was based on the "*Salnamés*," or official almanacs of the vilayets, and shows at the same time the distribution of the religious in the provinces, but it takes account only of the male population.

	Moslems.	Non-Moslems.
Vilayet of Bosnia.....	309,522	306,707
" Monastir.....	485,993	417,805
" Janina.....	250,749	467,601
" Salonica.....	124,328	124,157
" Adrianople.....	235,537	401,143
" Daube.....	455,767	715,938
	1,862,446	2,433,856

Constantinople, not included in any of the six vilayets, had a total population of 690,000. The total male population of European T., excluding the vassal provinces, was 4,976,000. The entire population of both sexes might, therefore, be assumed to exceed 10,000,000. The proportion of Non-Moslems to Moslems given above (57 to 43) probably understates the numerical predominance of the former.

Many of these estimates have of course become obsolete since the Berlin Congress of 1878 (see History of the OTTOMAN EMPIRE). This Congress, which met primarily to revise the "preliminary" treaty of San Stefano, concluded between Russia and Turkey at the close of the war of 1877-78, has revolutionised the relation of the Porte to the subject Christian principalities and provinces, alienated large portions of hitherto Turkish territory, and inaugurated what must necessarily be a new era in the history of the Ottoman empire. The principal results of the Congress's work are treated under the several heads of the states they chiefly concern (see ROUMANIA, SERBIA, MONTENEGRO, BULGARIA, &c.), but must here be briefly summarised.

The vassal states Roumania and Serbia, as well as Montenegro, were declared independent, and each obtained a change or extension of territory; Roumania, which had to yield up its portion of Bessarabia to Russia, received in compensation the Dobrudscha, cut off by a line from Silistria to Mangalia. Serbia was considerably extended to the south. Montenegro received an additional strip of territory round almost the whole of its former frontier, including part of the Adriatic seaboard of Antivari. What was formerly the Turkish vilayet of the Danube, was, with the exception of the Dobrudscha, now Roumanian, constituted a tributary but automatic principality, its southern boundary being the Balkan range. A large territory to the south of the Balkans was constituted into the separate province of Eastern Roumelia, and though remaining directly under the military and political authority of the Sultan, secured the right of having a Christian governor-general and administrative autonomy. It was agreed that Herzegovina and Bosnia, excepting a small portion of the latter, should be occupied and administered by Austro-Hungary, and thus in large measure alienated from the Porte; Spizsa and its seaboard, immediately north of Antivari, was incorporated with Dalmatia; Greece was to receive additional territory; the Congress recommending that the rectified frontier should run up the Salambria River from its mouth, cross the ridge dividing ancient Thessaly from Epirus, cut off the town of Janina so as to leave it to Greece, and descend the Kalamas River to the Ionian Sea. In Crete the reformed government promised in 1868 is to be immediately and scrupulously carried out. In Asia the changes were much less considerable: the port of Batum, henceforth to be essentially commercial, Kars and Ardahan, with a portion of Armenia, were ceded to Russia, and Khotour, east of Lake Van, to Persia; the Porte engaging to carry out at once much needed administrative reforms in Armenia, and to see to it that henceforth religious difference shall in no part of the Ottoman empire hinder any one from the full exercise of all civil and political rights, or exclude from public offices or the professions.

Another engagement, entered into by Turkey at the same time, seriously affects the standing of the empire, though it introduces no territorial change. By the "conditional convention" made between Turkey and the United Kingdom, the English government undertakes to defend the Porte's dominions in Turkey in Asia, and receives in return the right to occupy and administer the island of Cyprus.

A table of the area and population of Turkey in Europe (Turkey in Asia and Africa remaining substantially unaltered) would have to be thus arranged:

	Sq. Miles.	Pop.
I. Immediate Possessions, including Constantinople, the vilayets of Monastir, Salonica, the Isles, and Crete, and part of Janina and Adrianople.....	64,000	5,350,000
Arm. &c.....		300,000
II. Autonomous Province of Eastern Roumelia.....	15,000	1,000,000
III. Provinces of Bosnia and Herzegovina, administered by Austria.....	28,000	1,350,000
IV. Tributary Principalities of Bulgaria.....	33,000	2,000,000
Total of Turkey in Europe.....	138,000	10,000,000

TURKEY IN EUROPE, generally hilly and undulating, is traversed by a mountain system which has its origin in the Alps, enters T. at the northwest corner, and runs nearly parallel to the coast, under the names of the Dinaric Alps and Mount Pindus, as far as the Greek frontier. This range sends numerous offshoots east and west; the great eastern offshoot being the Balkans (q. v.) range, with its numerous branches to north and south. The rivers of Turkey are chiefly the tributaries of the Danube; the Maritza, Strumo, Vardar; the Narenta, Drin, and Voyutza.

On the high lands, the cold is excessive in winter, owing to the north-east winds, which blow from the bleak and icy steppes of Southern Russia; and the heat of summer is almost insupportable in the western valleys. Violent climatic change is, on the whole, the rule in European Turkey; but those districts which are sheltered from the cold winds, as the Albanian valleys, enjoy a comparatively equable temperature. The soil is for the most part very fertile; but owing to the positive discouragement of industry by the oppressive system of taxation which was long in force, little progress has been made in the art of agriculture, and the most primitive implements are in common use. The cultivated products include most of those usual in Central and Southern Europe—viz., maize, rice, cotton, rye, barley, and millet. The mineral products are, iron in abundance, argentiferous lead ore, copper, sulphur, salt, alum, and a little gold, but no coal. The wild animals are the wild boar, bear, wolf, wild dog, civet, chamois, wild ox, and those others which are generally distributed in Europe. The lion was formerly an inhabitant of the Thessalian Mountains.

TURKEY IN ASIA.—This portion of the Turkish empire is more hilly than the other, the two almost parallel ranges, Taurus and Anti-Taurus, which are the basis of its mountain-system, cover almost the whole of the peninsula of Asia Minor or Anatolia (q. v.), with their ramifications and offshoots, forming the surface into elevated plateaux, deep valleys, and enclosed plains. From the Taurus chain, the Lebanon range proceeds southwards parallel to the coast of Syria, and diminishing in elevation in Palestine, terminates on the Red Sea coast at Suai. Besides the Euphrates (q. v.), Tigris (q. v.), and Orontes (q. v.), the only important rivers of Turkey in Asia are the Kizil-Ermak, which rises on the borders of Cilicia, and after a devious course across the peninsula, falls into the Black Sea, near Samsoun; the Meander and Sarabat, which flow to the Aegean; and the Sakarin, which empties itself into the Euxine. On the whole, Turkey in Asia is ill-supplied with water; and though the mountain slopes afford abundance of excellent pasture, the plains, and many of the valleys, especially those of the Euphrates, Tigris, and Jordan, are reduced by the parching droughts of summer to the condition of sandy deserts. In ancient times, these now desert districts were preserved in a state of fertility by artificial irrigation; but during the six centuries of almost constant war which convulsed this once fair region, the canals were neglected, and have, ever since the rise

of the Osmanli power, remained in an unserviceable condition. Nevertheless, the fertile portions produce abundance of wheat, barley, rice, maize, tobacco, hemp, flax, and cotton; the cedar, cypress, and evergreen oak flourish on the mountain slopes; the sycamore and mulberry on the lower hills; and the olive, fig, citron, orange, pomegranate, and vine on the low lands. The mineral products are iron, copper, lead, alum, silver, rock-salt, coal (in Syria), and limestone. The fauna includes the lion (east of the Euphrates), the hyena, lyx, panther, leopard, buffalo, wild boar, wild ass, bear, wolf, jackal, jerboa, and many others; and the camel and dromedary increase the ordinary list of domestic animals.

Industry, Manufactures, and Trade.—Notwithstanding the primitive state of agriculture in T., the extreme fertility of the soil, which returns from 25 to 100 fold, makes ample amends for this defect, and supplies materials for the comparatively unimportant manufactures and industries of the country. The products are wax, raisins, dried figs, olive oil, silks, red cloth, dressed goat-skins, excellent morocco, saddlery, swords of superior quality, shawls, carpets, dye-stuffs, embroidery, essential oils, attar of roses, plum-brandy, &c. The commerce of T. is extensive and important, and under the influence of judicious regulations, is rapidly increasing. For the trade with Asia and Africa no statistics are available; but the exports to European States in 1875 were valued at about £2,000,000, and the imports thence at £14,500,000. The exports are the surplus of the above-mentioned natural and manufactured products of the country, also wool, goats' hair, meerschaum clay, honey, sponges, drugs, madder, gull-nuts, various gums and resins, and excellent wines; the imports are manufactured goods of all kinds, glass, pottery, arms, paper, cutlery, steel, amber, &c. The countries which trade with T. are, in order of importance, Persia, Great Britain, France, Austria, Russia, Egypt, &c.; and the principal commercial ports of the country are Constantinople, Trebizond, and Smyrna. In 1873, 250,937 vessels, of a tonnage of 18,159,000 tons, entered and cleared Turkish ports. The trade of T. is greatly impeded by the difficulty of land-transport; but of late many new roads have been formed, and there are now in operation nearly 600 miles of railway in Turkey in Europe, and above 100 in Asia.

Population.—A more heterogeneous aggregation of races than that which constitutes the population of the Turkish empire can hardly be conceived. Turks, Greeks, Slavs, Romanians, Albanians, are largely represented, besides Armenians, Jews, Circassians, &c., and Frank residents. In European Turkey, the Turks are estimated at 2,200,000; the Slavs, including the Bulgarians of the principality, at nearly 2,000,000; the Greeks at 1,030,000; the Albanians at 1,250,000; and the Roumanians at 1,003,000. Then in Asia there may be 4,450,000 Turks not to speak of those in Africa; of Turkomans, 100,000; of Kurds, 1,000,000; of Syrians 190,000—all in Asia; 1,000,000 Greeks; 2,400,000 Armenians (partly in Europe); as well as Jews, Arabs (in Asia and Africa), Druses, Franks or Western Christians, Gipsies, Tartars, Circassians and other kindred races, Copts, Nubians, Berbers, &c. Of these, the Greeks and Armenians are traders; the Slavic people and the Albanians are the chief agriculturists in Europe, and the Osmanlis, Armenians, Syrians, and Druses in Asia. Of the whole population about 25,000,000 are Mohammedans, and 15,300,000 Greek and Armenian Christians.

Administration, Religion, Education.—The government of T. has always been a pure despotism; the constitution granted in 1876 and revoked in 1878 was only nominal. The power of the Sultan (also called *Padiſchah*, Grand Seigneur, Khan, and *Hunkiar*) is much limited by the *sheikh-ul-islam*, the chief of the *Ulemas* (q. v.), who has the power of objecting to any of the sultan's decrees, and frequently possesses more authority over the people than his sovereign. The supreme head of the administration, and the next in rank to the sultan, is the grand vizier (*sadr-ı-azam*), under whom are the members of the cabinet or *divan* (*menasib-i-divanî*), namely the presidents of the supreme council of state (*alkiam-i-ultî*) and of the *Tauximat* (q. v.), the *Seraskier* (q. v.), the *capudan pasha*, or high admiral, and the other heads of departments of the administration. The governors of the *eyalets*, or provinces, are styled *walis*; each *eyalet* is divided into *sanzaks*, or *livas*, ruled by *kaimakans*; each *liva* containing a number of *cazas*, or districts; and each *caza* a number of *nahiyehs*, composed of villages and hamlets. The provincial governors have no longer the power of life and death; and the introduction of the system of tax-collection in practice in Western Europe, has greatly diminished their power of

practising extortion on those under their rule. The variable imposts are, however, farmed, but considerable restrictions are imposed on the farmers to prevent oppression. The established religion is Mohammedanism, but all other sects are recognised and tolerated; and since 1866, a Mussulman has been free to change his religion at pleasure, without becoming liable to capital punishment, as was formerly the case. Education was long neglected, but in 1847 a new system was introduced; and since then, schools for elementary instruction have been established throughout T.: and middle schools for higher education, and colleges for the teaching of medicine, agriculture, naval and military science, &c. Many wealthy Turks, however, send their sons to France or Britain to be educated. The newspapers published in T. are not all printed in Turkish; several of them are printed in Greek, French, and other languages.

Revenue. Army and Navy.—The total revenue and expenditure for the year 1872—1873 were respectively £19,488,375 and £19,458,570; the chief items being detailed in the following table:—

ORDINARY REVENUE.

Direct Taxes—	
“Vergil,” or Property tax.....	£2,960,490
“Bedel,” or Military Exemption Tax.....	597,350
Indirect Taxes—	
“Dimes,” or Tithes.....	6,814,250
Tax on Sheep.....	1,863,865
Tax on Swine.....	30,495
Customs.....	1,955,820
Other Indirect Taxes.....	2,008,265
Tributes—	
Egypt.....	681,390
Roumania.....	36,345
Servia.....	20,910
Samos.....	5,685
Monut Athos.....	685
Total Ordinary Revenue.....	£16,977,430
Extraordinary Receipts.....	2,514,915
Total Revenue.....	£19,488,375

ORDINARY EXPENDITURE.

Civil List of the Sultan.....	£1,189,880
Imperial Pensions and Charities.....	552,635
Interest of Public debt.....	8,593,865
Army and Navy.....	4,298,350
Public Instruction.....	73,535
Home Department and Police.....	2,150,090
Ministry of Finance.....	897,770
Total Ordinary Expenditure.....	£17,750,625
Extraordinary Disbursements.....	1,707,945
Total Expenditure.....	£19,458,570

But in spite of the official returns, it is notorious that for many years there has been a large deficit. The budget of 1875—1876 acknowledged a deficit (exclusive of the enormous war expenses) of £4,373,334; the receipts being given at £20,698,548, the expenses at £25,071,882. To meet deficiencies, as many as 14 loans had been raised between 1854 and 1873; the foreign debts of T. amounting in the latter year to no less than £173,409,487. Even before the proposal in 1876 of violent expedients for escaping part of its liabilities, the Turkish Exchequer was manifestly on the brink of insolvency.

The army is composed of the active or regular army (*nissem*), of the reserve

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(*redif*), and of irregular troops; the nizâm contains 44 regiments of infantry; 37 regiments of cavalry; 7 regiments of field-artillery; and a brigade of engineers. The irregular troops comprise 16 regiments of gendarmes, the now notorious Bashi-Bazouks (volunteer infantry receiving from government only arms and ammunition), and volunteer cavalry. The law of 1869 contemplated an active army of 220,000 men, with 80,000 in the first reserve, 420,000 men in the second reserve, and the *hiyade* or landsturm. Military service of 20 years (of which 4 are spent in the active army) is obligatory on all Moslems. The auxiliaries are 75,000, and the irregular troops 87,000.

The history of T. is given under OTTOMAN EMPIRE.

TURKEY (*Meleagris*), a genus of gallinaceous birds of the family *Pavonidae*, or, according to some ornithologists, of a distinct family, *Meleagridæ*, both, however, being included by others in *Phasianidae*. The head is bare, the neck wattled, and the bill of the male surmounted with a conical fleshy caruncle, sometimes erected, sometimes elongated and pendulous. A curious tuft of long hair springs from the base of the neck of the male, and hangs down on the breast. The bill is rather short, strong, and curved; the tail is broad and rounded, capable of being erected and spread out, as the male delights to do when he struts about in pride, with wings rubbing on the ground, uttering his loud peculiar *gobble*. The COMMON T. (*M. gallopavo*), the largest of gallinaceous birds, well known as an inmate of our poultry-yards, is a native of North America. It appears to have been introduced into Europe in the beginning of the 16th c., and is naturalised in some places; as it may be said to have been in the royal park of Richmond, near London, in the first half of the 18th c., when that park contained about two thousand turkeys; but in consequence of the frequent fights between poachers and keepers, it was thought proper to destroy them. Fewer attempts have been made than might have been expected to introduce the T. in parks and woods in Britain, where it might probably be expected to succeed as well as the pheasant. In a domesticated state, the T. varies much in plumage; in its wild state, this is not the case. The plumage of the wild T. is also richer, and its power of wing greater; but the wings even of the wild bird are short, scarcely extending beyond the base of the tail. The darkest-colored of domesticated turkeys most nearly resemble the wild T. in plumage. In its native woods, it seems to attain even a larger size than in the poultry-yard. Turkeys were once plentiful in the forests of the Atlantic states of North America, and as far north as Lower Canada, but have disappeared as cultivation has advanced, and have become rare even in the eastern parts of the Valley of the Mississippi, where their numbers were once very great. The T. is found as far south as the Isthmus of Darien, but does not occur to the west of the Rocky Mountains. It inhabits the woods of the larger islands of the West Indies. In warm climates, it is said to produce two or three broods a year; but in colder countries it produces only one. The males associate in flocks of from ten to one hundred, and seek their food during great part of the year apart from the females, which go about singly with their young, or associate in flocks, avoiding the old males, which are apt to attack and destroy the young. At the pairing-time, desperate combats take place among the males. Wild turkeys roost on trees. They feed on all kinds of grain, seeds, fruits, grass, insects, and even on young frogs and lizards. They make their nests on the ground, merely gathering together a few dry leaves, and often in a thicket. The eggs are usually from nine to fifteen in number, sometimes twenty. They spread themselves in summer over the higher ground; but in winter, congregate in the rich low valleys. The sexes mingle in winter, and form larger flocks than in summer.

On account of its size, and the excellence of its flesh and eggs, the T. is one of the most valued kinds of poultry. The management of it differs little from that of the common fowl. The young are tender for the first few weeks, and require care, particularly to keep them from getting wet by running among wet grass, or the like; but afterwards they are sufficiently hardy. Nettles are excellent food for turkeys, and are often chopped up for them, to be given in addition to grain, bran, boiled potatoes, and other such food.

The only other known species of T. is *Meleagris ocellata*, a native of the warmest parts of North America. It is not quite so large as the Common T., and has a smaller tail. The neck is less wattled, but the head has a number of fleshy tubercles. The plumage is beautiful, rivaling that of the peacock.

in metallic brilliancy: blue, green, bronze, red, and golden hues being intimately and finely mingled, and forming *eyes* on the tall; whence the specific name.

TURKEY BUZZARD. See **VULTURE**.

TURKEY-RED. This celebrated color—the most durable, and perhaps one of the most beautiful which has yet been produced on cotton—is dyed by a process supposed to have been practised in India from immemorial time. It passed from thence through other parts of Asia to the countries of the Levant, and was introduced into France about the middle of last century. The first successful attempt to introduce it into Great Britain was made in Glasgow in 1788, by a Rouen dyer named Papillon, in conjunction with Mr George Mackintosh, the father of the inventor of waterproof cloth. They established the celebrated Turkey-red business now carried on by Messrs Henry Mountell & Co. By an agreement with the Trustees for Manufactures in Scotland, Papillon allowed them to make his process public in 1803; and since then Turkey-red dyeing has been extensively carried on in Glasgow and its neighborhood, and also in Lancashire.

There is a mode of dyeing cotton red with madder practised by calico-printers—the cloth being previously bleached with chloride of lime—where the whole process only occupies a day or two. But in the case of Turkey-red, which is also a madder-dye, the operations are long and tedious, and the bleaching with chloride of lime especially objectionable. The following is an outline of the steps in the Turkey-red process, as usually conducted: 1. Unbleached calico is thoroughly washed at a dash-wheel or other washing-machine, and then boiled for some time in a solution of carbonate of soda. 2. The cloth is soaked in a bath containing a soapy emulsion of olive oil, sheep's dung, carbonate of soda, and water; and allowed to remain for a week or more impregnated with the solution, after which it is aired in the field, and dried in stoves. This operation is repeated at least three times. 3. The next stage, sometimes called "liquoring," consists in passing the cloth through an emulsion of olive oil and carbonate of soda, but without sheep's dung; after which it is aired in the field, and dried in stoves, as in the last operation. The "liquoring" is repeated at least four times. 4. The cloth now requires to be soaked in a weak alkaline lye of pearl-ash and soda, in order to remove any excess of oil. 5. The cloth is warmed in a bath containing a mixture of powdered oak-galls and sumach, or either of these substances alone, the operation being sometimes called "galling," and sometimes "sumaching." 6. The cloth is next steeped for twelve hours in a solution of alum, partially neutralised by carbonate of soda, but sometimes acetate of alumina is used instead of alum. Without this treatment, the dye could not be fixed upon the cotton. See **DYEING**. 7. When thoroughly washed, the cloth is ready to receive the red dye, which is produced by immersing it in a decoction of madder, to which some chalk and bullock's blood are sometimes added. It is put into the dye-bath when cold, and kept in it for two hours after it has been raised to the boiling-point. 8. It is next boiled in a weak solution of soap and soda, which removes a brown coloring matter present in the madder-dye, but more fugitive than the red portion. 9. Finally, the dyed cloth is cleared or brightened by boiling it in a solution of chloride of tin, and then washing and drying it. A more recent plan is to employ chloride of lime for the clearing.

The theory of Turkey-red dyeing is not well understood, which so far accounts for the fact, that it has been found impossible materially to shorten the process. The three most essential operations are the oiling, or rather the impregnation with an oleaginous soap, the mordanting with alumina, and the dyeing with madder; but it is found, that if any of the numerous dippings in the oily emulsions are left out, the color is inferior in proportion to the number of omissions. This is the least understood part of the process, and is no doubt the cause of the rich appearance of the dye, which approaches some of the fine reds produced on wool.

Besides being largely used in its plain state, Turkey-red cloth is extensively employed for handkerchiefs with white patterns produced upon them by discharging the color (see **BANDANA**); and of late years, articles of various kinds, with patterns in several colors, have been produced by ordinary calico-printing machines, where, by proper arrangements, the different colors are obtained on parts where the red color is discharged by chloride of lime.

TURKEY-STONE. See **HONES**.

TURKISH LANGUAGE AND LITERATURE. The Turkish is one of the Turanian (q. v.) Idioms, and is chiefly divided into Eastern and Western Turkish. The former is mainly represented by the Uigur (Jagatai), an idiom but recently recognised not only to belong to the Turkic stock, but to be its most ancient representative. Its forms are fuller and more pure, albeit, to a certain extent, harder and rougher. Its alphabet is formed from the Zabian, out of which have sprung also the Mongol and Mantahn. Besides this, the Kiptchak, spoken in Kasan and Astrakhan, forms a principal branch of the Eastern Turkish, for which, however, but little has hitherto been done from a philological point of view.

Of infinitely higher importance, however, is the Western Turkish, or language of the Osmaulis, which, through the conquests of the race, has spread far and wide over the whole of Western Asia, the Levant, and parts of Europe. The Osman or Western Turkish (emphatically Turkish) is more melodious and soft than the former, and so much mixed with foreign elements, chiefly Arabic and Persian, that, were it not for its grammar, which is purely Tatarian, it could hardly be called an original language, but rather a conglomeration of the three respective idoms. Besides, it has also received a large increase of words from other Asiatic and European languages, e. g., the Chinese, Greek, and Italian. It is one of the most widely spoken idoms; not only Western Asia, but even the east of Europe, use this tongue to a great extent for commercial and political transactions. The characters in which it is now written are no longer the original Uigur letters, but the Arabic, the 28 characters of which have been increased by the four additional Persian characters—produced by further diacritical points, and a new one of their own, amounting in all to 33, which are written from right to left, as is the case in all (save one) Semitic languages. But this alphabet is not well suited to a language composed, like this, of elements belonging to the three great families of speech, viz., Semitic, Indo-European, and Turanic. Neither the vowels nor the consonants are adequately represented in all cases. Occasionally, however, it is also written in Armenian characters, which renders its sounds much more faithfully. There is no definite article or gender. The plural is indicated by a final *lar* or *ler*, and the cases are formed by the addition of *ung*, *ek*, *i*, *den*, and *le* for gen., dat., accus., abl., and instrumental respectively; which are, in plural, affixed to the *lar* or *ler*. The adjective has no flexion, but is placed unchanged after the noun. Diminutives are formed, somewhat like in Italian, by suffixes. The comparative and superlative are formed by circumlocution. The personal pronouns are without gender, and their declension is like that of the nouns. The possessive pronouns are made by suffixes. The Turkish verb is of a very complex nature. There are seven *genera* (Active, Passive, Negative, Impossible, Causal, Reciprocal, Reflexive), all of which are formed by certain monosyllables affixed or prefixed. The root of the verb is the second person singular imperative, to which the infinitive affix *mak* or *mek* is joined. The moods and tenses are formed chiefly by the addition or the respective forms of the auxiliary verb *olmak*, to be. Apart from this, there are special particles to express the optative, conjunctive, &c. Conjunctions are either formed by gerundives or possessive forms, or they are borrowed from Persian and Arabic. Adverbs are formed by certain suffixes. The Turkish construction is most peculiar: the genitive always precedes the nominative, and the verb always stands at the end. All this gives the Turkish style a peculiarly artificial and inverted appearance, and often a sentence cannot be in the least comprehended until it is quite finished. Oriental flourishes, and allegorical figures of speech, with which Turkish is very lavish, do not tend to facilitate the study of the language.

The original literature of Turkey is to be found in the scanty remains of the Uigur period. That remote eastern branch of the Turkish family had, after their emigration from their homes, south of the Lake Baikal, to the Tangu T'agh, played a foremost part in the contests and migrations of Central Asia, until they disappeared in the Mongol Empire about 1200 A.D. They were acquainted with Chinese literature, and had adopted the Buddhist doctrines to a certain extent, and their scanty literary relics bear traces of these influences. When, however, the Turks, in the 11th c., began their conquest of the countries of Mohammedan Asia, they learned to appreciate the literature of Persia, then beginning to grow up in its full glory; and ever since, Turkish literature and Turkish language have retained a strong Persian impression. Two branches of Turkish literature are usually dis-

tinguished—first, the Eastern or Jagataian, which chiefly flourished between Timur's and Baber's time (1400–1530). Mir Ali Shir, the vizier of Sultan Hussein, is the most renowned poet of this period. He also collected the most ancient Jagatani poems. Sultan Baber, also belonging to this epoch, wrote Memoirs of his life and time (translated into English), which are of considerable importance. The other or Turkish literature, principally so called, is exceedingly rich, but hardly deserving the name of an original literature, it being, for the greatest part, a mere imitation of Persian and Arabic models. Of early writers, deserve special mention Sheikhli, a romantic poet and physician, and Soleyman Tchelebi. In the 16th c., the most flourishing period of Turkey, we find Meshihî, the poet; Kemal Pasha Zadeh, the historian and jurist. In history, we have, besides annalists like Snad-ed-Din, historians like Mohammed Effendi. Of the same epoch is Lamî, who excelled in many branches of literature, besides being an accomplished translator of Persian poets. Faîlî (d. 1563) and Baki, the chief of Turkish poets (d. 1600), conclude this period, which is followed by another of great activity, but of inferior rank. It boasts of Nebî, the poet; Neîî, the satirist; but above all, Hadji Khalifah (q. v.), the eminent historian, geographer, and encyclopædist. Raghib Pasha stands out in the 18th c., together with Saîd Efendî, and a number of smaller writers. Little is to be told of the present stage of Turkish literature; but there is a great activity now visible in the province of educational works, and the reproduction of ancient writing; a feature which augurs well for the future. Davids' (Lond. 1836), Redhbone's (Par. 1846), and Kasem-Beg's (Kusan, 1846; Gor. by Zenker, 1847) are the best known Turkish grammars; and Kieffer and Bianchi's ("Dictionnaire Turco-Française," 2 vols., Par. 1835), as well as Redhouse's and Zenker's, among the best dictionaries of the Turkish language.

TURKMANSHAI, a village of Azerbaijan, 65 miles east-south-east from Tabriz, is the place where, on February 22, 1828, was concluded the treaty between Persia and Russia, by which the former resigned to the latter the provinces of Erivan and Nakchevan.

TURKS, the name of a numerous, important, and widely-spread family of the human race, members of which are to be found as well on the banks of the Lena in Siberia, as on those of the Danube and the shores of the Adriatic in Europe. The "T." belong to the second of Blumenbach's five great divisions of mankind—viz., *Mongolians*; and to the first, or *Mongolidae*, in Dr Latham's three-fold classification. In this latter classification, the T. form a branch of the Turanian stock of Altaic Mongolidae. Their geographical distribution, according to Dr Latham, is as follows: "1. As a continuous population. East and west; from the neighborhood of the Lake Baikal, 110° e. long., to the eastern boundaries of the Greek and Slavonic countries of Europe, about 21° e. long. North and south; from the northern frontiers of Tibet and Persia, about 34° n. lat., to the country north of Tobolsk, about 69° n. lat. 2. As an isolated population. Along the lower course of the Lena, and the shores of the White Sea, chiefly within the Arctic Circle. 3. As portions of a mixed population in China, Tibet, Mongolia, Persia, Armenia, the Caucasian countries, Syria, Egypt, Barbary, Greece, Albar'a, and the Slavonic portion of Turkey in Europe." The names Tourkoi, Turkai, and Turce occur in some ancient authors as applied to a Scythian people dwelling in Asiatic Sarmatia, and it is very likely that the Scythians of antiquity were allied in blood with the numerous existing Turkish tribes, if not absolutely their ancestors. The original seat of the T. was probably upon the northern slopes of the Altai range, from which, while a portion emigrated into Independent Turkestan, others, going south-south-east, established themselves upon the confines of the Chinese Empire. MM. Abel-Rémusat, Klaproth, Ritter, and other high authorities, concur in tracing all the now existing Turkish tribes to the Hiong-nu, a powerful nation who, prior to the Christian era, threatened to overrun and subjugate China, and who then occupied the whole of the vast region now called Mongolia, from the north of China to Mount Altai. Dr Prichard coincides in this opinion. The Hiong-nu (or *Vile Slaves*, so called by the Chinese), indeed, for some time succeeded in establishing a kind of rule in China, and even intermarried with the Imperial family; but about the commencement of the Christian era, their power in China began to wane, and before the end of the 2d c. they were driven back as far as Independent Turkestan. "After the fall of the

empire of Hiong-nu," says Prichard, the T. "are known in Chinese history by the name of Thu-k'ia, or Turks, and Whey-on-cui, by Europeans written Huy-hurs, and more correctly, Uigours. The Uigours, or Eastern Turks, whose history has been elucidated by Abel-Rémusat, are the link of connection between these more remote nations and the Seljuki and Osmani Turks, who are known to European historians."

After the fall of the Hiong-nu empire in China, the tribes who composed its strength separated, some maintaining themselves in their acquired settlements, and even conquering portions of China; but by far the greater number spread westward over Western Mongolia, East and West Turkestan, and Southern Siberia, and gradually lost their power and unity as a nation. Out of this débris of a fallen people arose, in the 5th c., the great empire (the empire of Kiptchak) of the Thu-k'ia, which contested the supremacy of Central Asia with the Chinese on the east, and the Sassanides (q. v.) on the west, ultimately falling in 744 before the Hoel-he, a confederation of Turkish tribes which had hitherto been subject to it. The Hoel-he, attacked in the west by the Hakas (the ancestors of the present Kirghis), yielded to their assailants in 848, but retained their power east of the Bolor-tagh, and for 150 years longer ruled supreme from that range to the Hoang-ho. During the eight centuries succeeding their expulsion from China, a regular though slow progress westward had been maintained by some of the Turkish tribes, a portion of whom appear (5th c. A.D.) in Southern Russia, and on the northern frontier of the Byzantine Empire, driving before them the kindred race of the Avars. They were found in Syria and Mesopotamia in the 7th c., and about the same time wandered into Northern and Eastern Khorassan. But the seat of power of the Turkish race still was in Central Asia, whence in the 10th c. the Seljuks (q. v.) emerged, conquering Persia, Syria, and Asia Minor, and establishing an empire which reached from Constantinople to the borders of Mongolia. The subdivision of the Seljuk empire in South-western Asia led to its gradual absorption by the Khaurezmians in the north, and the Kurds in the west, till the irresistible tide of Mongol invasion under Genghis Khan (q. v.), rolling over Central and Western Asia, and the east of Europe, completely overwhelmed Turkish dominancy. The great empire of Timur (q. v.) was Turk, with a strong infusion of the Mongol element, the residue of Genghis's irruption; and its destroyers, the Uzbeks (q. v.), and the various other tribes—Kirghis, Kiptchaks, Turkomans, &c.—which now possess its extensive domains, are also of Turkish race. The Osmanli-Turks are descended from a portion of the Turkish tribe of the Kayi, which fled from its settlements in Khorassan before the Mongols, and took refuge with the Seljuks of Iconium. See OTTOMAN EMPIRE, SELJUKS, &c.

The following is the enumeration of the principal Turkish tribes given by Dr Latham: "1. *Uigurs*.—On the Mongol frontier. Belonging to China. The Uigurs were the first Turks that used an alphabet. Little known. 2. *Turks of the Sandy Desert*.—Continuous with Mongolia and Tibet. 3. *Turks of Khoten, Kashgar, and Yarkend*. 4. *Kirghis*.—Independent Tartary. The Kirghis (q. v.) form a portion of the population of the highest table-land in Asia—perhaps in the world—Pamir and the source of the Oxus. 5. *Uzbeks* (q. v.).—The Turks of Bokhara. 6. *Turkomans*.—The Persian frontier of Independent Tartary from Balkh to the Caspian. Pastoral robbers. 7. *Ottoman or Osmanli*.—The Turks of the Turkish Empire. 8. *Nogays*.—The Turks of the parts between the Black Sea and the Caspian, north of Caucasus. 9. *Turks of the Russian Empire*.—Bashkirs, Teptyurs, Baraba, &c. With all these, although the language is Turk, there is good reason to believe that the original substratum is Finn. With the Bashkirs, this is generally considered to be the case. 10. *The isolated Yakuts of the Lena*."

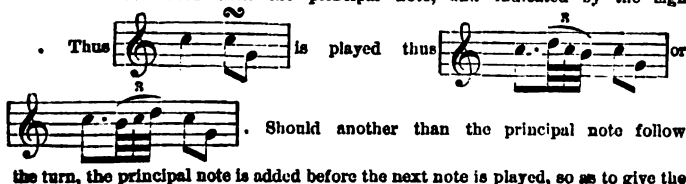
In physical appearance, all these tribes, with the exception of the Ottoman T., partake more or less of the Mongolian type. They have in general a broad, flat face, with prominent cheek-bones, the head from side to side nearly equal to its length from the forehead to the occiput, the nose flat, the eyes small, the color of the skin yellowish, straight hair, little or no beard, and stature undersized. It is among the nomad and agricultural T. that these characteristics are most prevalent, while among the more civilised they almost entirely disappear. Dr Prichard quotes Lieutenant Wood's account of the Kirghis as a good average description of the primitive Turkish tribes. "In stature," he says, "the Kirghis are under the middle height; of a *kyl* numbering seven men, the tallest was 5 feet 5½ inches in height. Their countenance is disagreeable; the upper part of the nose sinks into the face, leaving the

space between their deeply-seated and elongated eyes without the usual dividing ridge; the brow immediately above the eye is protuberant, but starts back more abruptly than in Europeans; their cheeks, large and bloated, look as if pieces of flesh had been daubed upon them; a slender beard covers their chin; and in those individuals who have more luxuriant hair, the beard has a natural curl. Their persons are not muscular. Their complexions are darkened by exposure to all weathers rather than by the sun. The women are rather good-looking, and of delicate form, like the Hazaras, and make good wives." The T. of the Turkish Empire, especially those of the upper classes, differ considerably from the type here described. The Ottoman T., in fact, both in feature, height, and general physical structure, bear a strong resemblance to other European nations. This is accounted for chiefly by the custom now prevalent among them for ages of intermarrying with Circassian females.

The various Turkish tribes speak very nearly the same language: "so much so, that the Yakut of the Icy Sen is said to be intelligible to the Turks of Central Asia, and even of Constantinople." In religion, the T. are for the most part Mohammedans; but the Yakuts are Shamanists; the T. bordering on the Chinese Empire are Buddhists; and those of Siberia, Christians of the Russo-Greek Church.

TU'RMERIC (*Curcuma longa*; see CURCUMA), a plant of the natural order *Scitamineae*, a native of the East Indies, much cultivated both in India and in Cochiu-Chiu. The leaves are lanceolate, sheathing each other at the base, about a foot long; they spring from the crown of the root, and from their centre rises a short leafy spike, with small cream-colored flowers. The root is divided into several fleshy fingers, oblong, and as thick as a man's thumb, sometimes crooked when young, and the root then abounds in a kind of arrow-root; but in a more advanced stage, it contains in large quantity a peculiar, resinous, yellow substance, which is used as a dye-stuff, and for other purposes, and is called *Tumeric*. It appears in commerce in the form of dried roots, or as a powder. It depends for its value chiefly on a resinous principle called *Curcumin*, which is scarcely soluble in alcohol and ether. The yellow color obtained from T. is not very durable, although it is employed as a dye both for silk and wool. Chemists make use of T. as a test for alkalies, which change its yellow color to reddish brown, as do also their carbonates and phosphates, some of the alkaloids, and boracic acid. T. test-paper is made by immersing unsized paper in tincture of tumeric. It is much employed in the East in medicine, as a gentle laxative, diuretic, and stimulant. It is also much used as a condiment with many kinds of food, and is the principal ingredient in *Curry-powder*. For its cultivation, T. requires a rich friable soil, and a situation not liable to be flooded. It is propagated by cuttings of the root, which are planted at distances of eighteen inches or two feet. It is planted in April or May, and the crop is gathered in December. This kind of T. is sometimes distinguished by the name of *Loxe T.*; and the name of *ROUND T.* is given to *Kaempferia pandureta*, a plant of the same order, also a native of the East Indies, the roots of which are shorter and rounder, but otherwise of very similar quality. They are not nearly so much an article of commerce as the other kind, but are particularly valued for the preparation of an artificial gold varnish, as they yield a better color than the long or true Tumeric. The Arabic name of T. is *Kurkum*, whence *Curcuma*.

TURN, in Music, an embellishment formed by the adjoining notes above and below combined with the principal note, and indicated by the sign



Turnau
Turning

24

turn four notes; thus:



is played

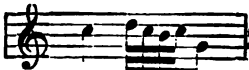


In either of these cases, the turn must be played during the time of the principal note. But when the sign is placed above or below the principal note, the first note of the turn takes the place of the principal, which is played in combination

with the others; thus



is played



TURNAU (Boh. *Turnové*), a walled town of Bohemia, circle of Jung-Bunzlau, on the east bank of the Iser, 50 miles north-east of Prague. It has a church, built in 1835, which is reckoned one of the most beautiful in Bohemia. T. has manufactures of cotton, woollens, and more particularly artificial gems, which are exported in great quantities to the United States. Pop. 4700. Here was fought (July 1866) a battle between the Prussians and Austrians, in which the former were victorious.

TURNER, Joseph Mallard William, the greatest of British landscape-painters, was born at 26 Maiden Lane, Covent Garden, London, in 1775. The precise day of his birth is unknown; but an approximation to it is furnished by his baptism, which is registered in the parish church as of date 14th May of that year. He was the son of a barber, and received an exceedingly defective education. His turn for art shewed itself very early, and drew attention to the boy. To a Dr Mouru, in particular, who gave him access to his excellent collection of water-coloring drawings, and otherwise kindly furtherance, he used afterwards to express his obligations. In 1789, he became a student at the Royal Academy, where, doubtless, he learned something; but throughout he seems to have been indebted less to any formal teaching than to the tentative efforts of his own singularly original genius. In 1793, when only twelve years old, he exhibited two drawings at the Royal Academy. Again, in 1796, he exhibited; and thence onwards till his death, with intermission of only one or two years, his pictures were regularly to be found on the walls. His success is sufficiently shewn in the fact, that so early as 1799 he was elected an Associate of the Royal Academy, and only three years afterwards, attained the full dignity of Academician. The honor was worthily bestowed on one whose claim was already admitted to as the first landscape-painter of his time; but his election in 1807 to the post of Perspective could scarcely be considered so judicious. A man so abnormally illiterate that his simplest note included a crop of solecisms, was not likely to succeed as a lecturer; and as a lecturer he failed utterly. The knowledge which he abundantly possessed, he could not in the least communicate; and after a very few years, he ceased to make the attempt. In the exercise of his art, T. travelled much; and was frequently in Scotland, France, Switzerland, and the Rhine countries; and in 1819, 1822, and 1840, he paid visits to Italy. His industry was almost as unexampled as his genius. To the exhibitions of the Royal Academy, he contributed in all 250 pictures; but among these, many of his finest works were not included; and in another branch of art, the amount of his achievement was extraordinary. In 1808, he commenced the publication of his famous "Liber Studiorum," a series of engravings from original designs, which ranks as one of his most important undertakings; to this is to be added his "Scenery of the Southern Coast," "England and Wales," "Rivers of England," "Rivers of France," &c.; and besides, his services were continually in request as an illustrator. The illustrated edition of Rogers's "Poems" is his most celebrated work in this kind, and is quite unique in magnificence. At his death, which took place 19th December 1851, at Chelsea, where his few last years were passed in a small house by the river-side, it was found that he had bequeathed to the nation the noble collection of his works, which now occupies a room in the National Gallery, and remains a permanent monument of the power and splendor of his genius, if also of its occasional eccentricity and extravagance. The large fortune, amounting to something like £200,000, which he had amassed by his industry and thrift combined, he left to found an asylum for de-

cayed artists; but owing to some technical defect in his will, this purpose could not be carried out.

Of the genius of T., and the various phases through which it was developed till it sunk in the decay and delirium obvious in the work of his few last years, we cannot here attempt to treat. In the eloquent pages of Mr Ruskin's "Modern Painters," the subject will be found thoroughly discussed. Some years since, a "Life of Turner," in two volumes, was published by Mr Walter Thornbury. The picture it presents is a somewhat dark and painful one. This creator of the beautiful oil canvas was in his character and way of life by no means so surprising a revelation of it. He was coarse, sensual, sordid, avaricious: of his inordinate passion for money, many odd anecdotes are extant; but it is only fair to say, that by the few friends who knew him intimately, he was held to be essentially a man of kindly and generous nature. He lies buried in the crypt of St Paul's, beside Sir Joshua Reynolds.

TURNER, Sharon, the Anglo-Saxon historian, was born in London, September 24, 1768, articled to an attorney at the age of fifteen, and succeeded his master in the business before the period of his clerkship had expired. He continued, however, to gratify his literary tastes; and after years of hard reading and patient collection of materials, published 1799—1805, a "History of the Anglo-Saxons," in 8 vols., a work, with all its imperfections, that has given its author a permanent place in English literature. Other writings of T.'s are: "The History of England from the Norman Conquest to 1509" (1814); "History of Henry VIII." (1826); and "Reigns of Edward VI., Mary, and Elizabeth" (1829); all of which were subsequently republished together under the title of "History of England from the Earliest Period to the Death of Elizabeth;" "Sacred History of the World as displayed in the Creation and Subsequent Events to the Deluge" (1832, *et seq.*); a volume of essays and poems, &c. T. died February 18, 1847.

TURNHOUT, a well-built town of Belgium, province of Antwerp, 34 miles east-north-east of the city of Antwerp, in the district known as the Campine (see BELGIUM), and the terminus of a branch-line of the Brussels and Antwerp Railway. The inhabitants manufacture ticking, and linen and lace goods, cutlery, playing-cards, paper, oil, &c. Pop. (1870) 14,500. T. is historically noteworthy as the scene of two battles, the first won 22d January 1597, by the Netherlanders, under Maurice, Prince of Orange, over the Spaniards; and the second, 27th October 1769, by the patriots under Van der Mersch, over the Austrians.

TURNING, the art of shaping wood, metal, ivory, or other hard substances into forms having a curved (generally circular or oval) transverse section; and also of engraving figures composed of curved lines upon a smooth surface, by means of a machine called a *turning-lathe*. This art is of great importance and extensive application in mechanics, the most delicate articles of luxury and ornament, equally with the most ponderous machinery, being produced by it. The art of turning dates from a very early period, and Theodorus of Samos (about 560 B.C.) is named by Pliny as its inventor; but long before this period, the *potter's wheel* (see POTTERY), the earliest and simplest form of turning-machine, was in general use, as is evidenced by numerous references in Holy Writ. The immense variety of work performed by turning-machines necessitates great variations in their construction; but their mode of operation is always the same, and consists in fixing the work in position by two pivots or otherwise, causing it to revolve freely round an axis of revolution, of which the two pivots are the poles, and holding a chisel or other cutting-tool so as to meet it during its revolution, taking care that the cutting-tool be held firmly and steadily, and moved about to different parts of the work till the required shape be obtained. Lathes are divided, with respect to the mode of setting them in motion, into *pole-lathes*, *foot-lathes*, *hand-wheel lathes*, and *power-lathes*; with respect to the species of work they have to perform, into *centre-lathes*, which form the outside surface, and *spindle, mandrel, or chuck lathes*, which perform hollow or inside work, though this distinction is for the most part useless, as all lathes of good construction are now fitted for both kinds of work. *Bed-lathes* are those used by turners in wood, and *bar-lathes* for the best sort of metal-work; and the small metal centre-lathe employed by watchmakers is known as a *turn-bench*.

The primitive and most simple form of lathe for wood-cutting is the *pole-lathe*. It consists of two planks or beams placed horizontally side by side with a narrow

space between them, which, being firmly supported at a convenient height, constitute the *bed*; of two uprights or *puppets* rising from the bed, one of them stationary at the left end, and the other sliding along over the slit between the beams, and capable of being fastened at any required point by a projecting tenon and wedge beneath; of a *treadle* below and parallel to the bed; and of an elastic *pole* or *lath* (whence some derive the name lathe) fixed to the ceiling above. This form of lathe is well adapted for turning long thin cylinders of wood, the piece to be turned being held fast at each end by the conical iron or steel point projecting from the inner face of each puppet. Motion is communicated to the work by a cord which is fastened to the lath overhead, wound twice or thrice round the work, and then attached to the treadle below. When the workman presses his foot on the treadle, the work commences to revolve rapidly, unwinding the cord towards the treadle, and winding it up on the side next the pole, causing the latter to bend considerably. During this period, the workman has been holding his cutting-instrument to the work; but after the treadle has been quite pressed down, he removes his foot, and the reaction of the bent pole causes the work to revolve in an opposite direction, till the pole has straightened itself; and during this latter revolution, no cutting is done. When the whole piece is to be turned, the cord must be moved from an unfinished to a finished part of the work. For the pole, an elastic steel bow and string are substituted when the work is light or flue, the cord being attached to the middle of the string, and the bow fastened to the ceiling by its centre. The advantage of the pole-lathe is, that it never acquires an impetus in the direction of the cutting motion, for whenever the pressure on the treadle is removed, the reaction of the pole takes effect; but the great waste of time during the straightening of the pole and rising of the treadle, has caused the abandonment of this machine for the foot-lathe. The foot-lathe, the most common and generally useful form of lathe, differs from the former in having a *head-stock* or *fast-head* in place of the left-hand stationary puppet. This head-stock, III (fig. 1), con-

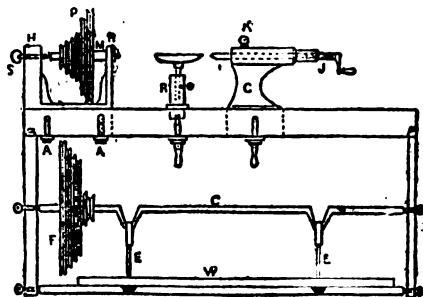


Fig. 1.

sists of two supports or puppets firmly connected at their base, and fastened at right angles to the bed by means of the screws A, A; the outer puppet is pierced for the screw S; and the inner is supplied with a steel collar, within which the mandrel, M, which carries the speed-pulleys, P, turns. The left end of the mandrel is concave, so as to allow the steel point of the screw, S, to fit closely. R is a *rest*, which slides along the slit between the two beams of the bed, and may be clamped at any point, and elevated or depressed as is found necessary. The rest is used by the workman for leaning his cutting tool upon, in order to afford it greater steadiness. G is the right-hand puppet *front-head*, or *tail-stock*, movable along the slit in the bed, and capable of being fastened like the rest; its point, I, can be advanced or retired as

required by means of the screw, *J*. *C* is the spindle, which, being connected with the treadle, *W*, by means of the rods or chains, *E*, *E*, turns the fly or foot wheel, *F*, and by means of an endless band connecting the latter with the speed-pulleys, communicates motion to the mandrel. The pulleys on the spindle and mandrel are of different sizes, and so arranged, that when the endless band is placed on the left-hand pulleys, an extremely rapid motion is communicated to the mandrel, the motion being reduced more and more as the band is transferred more to the right, till, at the extreme right, the rotatory motion is much slower than that of the spindle. When the foot-lathe is required for centre-work, the inner end of the mandrel is furnished with a point similar to *I*; but when hollow or inside work is to be done, it must be armed with a screw, as in the figure. In this latter case, certain contrivances, known as *chucks*, for holding the work, are screwed on to the end of the mandrel. Some of these most commonly used are the *screw-chuck*, which shews on its right side a flat circular surface, from the centre of which projects a large, coarse, conical screw for holding firmly any large piece of wooden work; the *hollow chuck*, a strong circular cap with perpendicular sides, into which one end of the work is firmly fastened by a mallet, or, if too small, by four screws working inwards through its sides; the *drill-chuck*, of a cylindrical form similar to the last, but with a square cavity for holding drills, the instrument, and not the work, being made to rotate in this instance; and the *concentric chuck*, a most ingenious piece of mechanism—a flat plate with two slits almost to the centre, and in line of a diameter, within which slits works a spindle, with screw-ends carrying two steel studs, whose heads project through the slits above the surface on the right side; these heads carry two curved pieces, which serve as clamps to hold the work; and as the spindle-screws are of the same fineness, and with right and left threads, the revolution of the spindle either removes both further from the centre, or brings both nearer to it; hence, when the studs are once set at equal distances from the centre, they always remain so, and the work may be removed and replaced without danger of destroying the adjustment. All these chucks are of metal, and are mostly employed for heavy work; turners of wood or ivory preferring wood-chucks, which can be altered as required, and secured by an iron ring round the outside, to prevent splitting. The cutting-tools employed are very various: gonges are used to rough out the work—if soft wood—after which chisels with a straight oblique edge are employed: the instruments for harder materials, such as ivory or bone, are smaller than the former, and have their sharp edges “better backed,” for inside-work, drills are first employed to make an opening, and then cutting-tools of various shapes are employed, according to the form which is wished to be given to the interior surface. To avoid the imperfections in the workmanship arising from unsteadiness of hand in the workman, the *slide-rest* is employed. This valuable addition is furnished with two motions, one towards the work, and the other along, parallel, or at any inclination to it, according as cylindrical or conical figures are required; there is a socket for the chisel, which is firmly held in its place by a screw; and after the slide-rest has been adjusted, the operator has only to move the rest forwards or sideways, as may be required, the motions being affected by two screws and winches.

The *hand-wheel* lathe is similar to the former, but so much larger as to require two workmen, one of whom is employed in setting the instrument in motion by turning a wheel, which corresponds to the wheel *F* in fig. 1. The *power-lathe* is similarly set in motion by horse, water, or steam power, and is employed for heavy metal-work, as piston-rod, iron columns of various kinds, wheels, artillery, &c. This machine differs from the foot-lathe chiefly in the substitution of rack-work, and wheels and pinions, for the endless band, and for manual labor, in the various adjustments of the machine, such as in moving forward the tail-stock, &c.; and in the mandrel being supported by both puppets of the head-stock. In wood-turning, the wood is first prepared by a hatchet and rasp, must be lightly though firmly pressed against by the cutting-tool; while metal work must be cleaned from the sand of the mould or scales of the forge, and in turning, requires less care. Soft woods must be made to revolve with great rapidity; very hard woods and brass require much less velocity; wrought iron and copper, still less; steel, a further diminution of speed; and cast iron, the least velocity of all. After the work has been duly shaped, it requires to be polished; and this is effected while it is still in the

lathe and rotating, by applying shark's skin to wood, pumice-stone and chalk to ivory and horn, and emery, tripoli, or putty powder to metals.

Hitherto, we have supposed that the axis of revolution of the work is fixed, and consequently that all work has been turned so as to present a transverse circular section; but many others forms of section may be easily obtained. The general mode of obtaining these non-circular figures is by screwing on to the mandrel an apparatus, by means of which the work can be thrown out of the centre of rotation at regular intervals; but as each different class of form requires a separate kind of apparatus, it is impossible here to describe the operations in detail. One species, however, known as *rose-engine turning*, and employed for producing involved curvilinear figures, such as appear on bank-notes, and on ornamented gold, silver, or gilt work, is so peculiar and ingenious, as to call for more special notice. In this species, the standards which support the mandrel, are no longer fixed at right angles to the bed, but are capable of oscillating backwards or forwards in a plane parallel to the plane of rotation of the mandrel, and are so acted on by a spring, that when pushed to one side they are at once restored to their former position on the pressure being withdrawn. Suppose, then, a metal wheel with its rim waved or luted, fastened concentrically on the mandrel, and the mandrel, pushed aside by a fixed steel point or roller, applied to the rim of the wheel; the reaction of the spring against the pressure of the roller will keep the latter in close contact with the waved rim throughout, and will produce a definite oscillatory movement of the mandrel, of the chuck, and the work fastened on it, and consequently—the cutting or graving tool being firmly held by the slide-rest—definite deviations from a circle in the lines marked on the face of the work. The wave-rimmed wheel, called a *rosette*, may be replaced by another, and that by a third, and so on till a sufficient number of different waved lines are obtained. A number of rosettes are generally strung at once on the mandrel, and the fixed guide is brought into gearing by means of a steel band called a rubber, with one rosette after another. Similar concentric curves of greater or less perimeter are obtained by removing the slide-rest from, or bringing it nearer to, the axis of revolution.—For more complete information respecting this most interesting machine, and its many varieties of form and application, see article "Turning" in the "English Cyclopædia," Holtzapffel's "Turning and Mechanical Manipulations" (Lond. 1847—1852), and "Tourneur" ("Manuels-Roret"), by Valicourt (Paris, 1856).

TURNIP (*Brassica rapa*; see **BRASSICA**), a biennial plant, with lyrate hispid leaves; the upper part of the root becoming, especially in cultivation, swollen and fleshy. It is a native of Europe and the temperate parts of Asia, growing in borders of fields and waste places. It is commonly regarded as a native of Britain, although in most cases of its being found apparently wild, it may be doubted if it has not derived its origin from cultivated varieties. It has been long cultivated, and is to be found in every garden of the temperate and cold parts of the world as a culinary esculent; it is also extensively grown in fields for feeding cattle and sheep. It was cultivated in India long before it could have been introduced by Europeans, and is common there in gardens and about villages. The cultivated varieties are very numerous. In them, the upper part of the root assumes a globose, oblong, or roundish depressed form. Some are common to the garden and the farm, and some of the largest kinds attain such a size as to weigh 20 or 25 lbs. Although the T. is of great value for feeding cattle, and the introduction of it into general-field-culture was one of the greatest improvements ever effected in the husbandry of Britain, it is not very nutritious, no less than 90—95 parts of its weight actually consisting of water. Garden turnips are sown from the end of March to the end of August; field turnips generally in June, it being requisite that they should not be sown so soon as to incur a risk of their throwing up flower-stems in the first year, which, when it takes place, prevents in a great measure the swelling of the root, and renders it coarse and fibrous. In the garden cultivation of turnips, the root is generally intended for use in the first year. In dry weather, the plants are apt to throw up flower-stems, and so disappoint the hope of the gardener; which is also the case if the seed is sown too early in spring. Moist cloudy weather is most favorable. Garden turnips are sown, and allowed to grow, much closer than field-turnips; being gradually thinned out, and the thinnings used even when of small size. The varieties both of garden and field turnips are very numerous. The garden turnips are

generally of comparatively small size, more rapid in growth, and more delicate.—The SWEDISH T., or RUTA BAGA, which was introduced into cultivation in Britain, from the north of Europe, more recently than the common T., and has proved of very great value to the farmer, is regarded by some botanists as a variety of the same species, and by some as a variety of *Brassica napus*, but more generally as a variety of *B. campestris*, a species common in corn fields and sides of ditches in Britain and the north of Europe.

The cultivated T. grows best in a rich free soil. The mode of culture varies with the soil. Where the soil is light and dry, a smaller amount of ploughing, harrowing, and drilling is necessary than on stiff soils. The T. is not well suited to clay soils, although it is often grown on them. A complete pulverisation of the soil is requisite before the sowing of the seed. On light soils, a crop of turnips generally succeeds wheat or oats. T. land is generally made up in raised drills, by the plough, and the seed is sown by the drilling-machine, on the top of the narrow ridges, which are about 27 inches apart. Small doses of guano, superphosphate of lime, crushed bones, or other such manures, produce great crops of turnips. They seem to act chiefly whilst the plant is young; and when it is further advanced, it derives nutriment from the soil, and even from the sub-soil, by deeply penetrating roots, and from the atmosphere by its large leaves. See BONES AS MANURE. The young plants are thinned out by the hand hoe, to a foot or upwards apart, and the ground is stirred and carefully kept clean by the plough or horse hoe. The T. crop is thus of great use in clearing the land of weeds. In many places, part of the crop is eaten on the ground by sheep, which are confined to a small part of the field by means of movable fences. It is common to leave one of each three rows of turnips for this purpose, the other two rows being carried to the farmyard for feeding cattle, or stored. Turnips are stored either in a house, or in conical heaps, covered with their own leaves, or with straw and earth. They are sometimes protected from frost by being earthed up in rows by the plough. Some kinds are much more easily injured by frost than others; the Swedish turnips least of all.

The introduction of the T. as a field-crop is one of the most important events in the history of British agriculture. It has rendered possible a rotation of crops, which has been extremely advantageous, and has made the supply of butcher-meat more constant, by providing a supply of winter-food for cattle and sheep, whereas, formerly, all depended on the pasture. T.-husbandry was introduced into Scotland from Norfolk in the latter part of the 18th c., but soon attained a development, and was carried to a perfection in Scotland far beyond what it had previously reached anywhere. The climate of Scotland is particularly adapted to it, as is also that of Ireland; moist weather, both in summer and autumn, being suitable to the T.; whilst the climate of North America is so unfavorable to it, that it has not become an important crop there. Of late years, T.-crops in Britain have suffered very much from the disease called Anbury (q. v.), or *Fingers and Toes*. This is not the case in Norfolk, and the exemption is supposed to be due to the use of clay-marl as a manure; but the whole subject is involved in obscurity. The T. not infrequently suffers from a fungus of the genus *Botrytis* (*Bi parasitica*), allied to that which is supposed to cause the potato disease. It infests plants of rank growth, attacking their roots, which are weakened by the too great luxuriance of the leaves. Plants weakened by drought are liable to suffer from a white mould, a species of *Oidium*, which attacks the leaves, and renders the plant worthless. The leaves are devoured by the T.-fly, T.-flea, or T.-beetle (*Haltica nemorum*), and by other species of the same genus. The Nigger Caterpillar, the larva of *Athalia spinarum*, also devours the leaves, as well as the caterpillars of White Butterflies (*Pontia brassie, rapae*, and *napæ*), and of some moths. The leaves are also mined by the larvæ of several dipterous flies. Several species of aphids suck the juices of the leaves, and one (*A. floris rapæ*) devotes its attention to the young crops in seed-leaf, which are also attacked by a rose-chaffer (*Cetonia aurita*), and a minute beetle (*Meligethes æneus*). Slugs, snails, and wire-worms are among the enemies of the turnip.

The young leaves of the T. are good as greens, and particularly those of the Swedish T., when it has begun to sprout in spring.

TURNIP-CUTTER, an implement used for cutting turnips for cattle. It is useful, not only as saving the teeth of sheep, which are apt to be much injured by eating turnips, but as preventing waste, for sheep feeding upon turnips scoop out a part,

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and leave the rest to rot. The oldest and simplest turnip-cutter acts by mere pressure, and is like a large nut-cracker on a stand. Many kinds are now in use, of which perhaps the best are those having knife-edges on the surface of a cylinder or cone, which are brought to act on the turnips by turning a handle.

TURNIP-FLY, a name given to several insects destructive to turnips. It is often given to *Altica* (or *Haltica*) *nemorum*, also called **TURNIP-FLEA**, from its skipping or leaping powers, but which is truly a very small beetle, with long and strong hind-legs, and ample-wings, of a shining black color, with two yellowish stripes down the wing-cases, and ochreous legs. It swarms in meadows and and hedge-rows in most parts of Britain from March to October, the larva feeding on many cruciferous plants. It often commits great ravages in turnip-fields, whilst the turnips are very young. The female lays her eggs on the under-side of the leaf, and the minute larva mines in the leaf, under the skin, making a tortuous gallery. Farmers sometimes steep the seed of turnips in order to prevent the ravages of this insect, but no good can be thus done, as the eggs are not in the seed.

The **TURNIP-FLY**, more properly so called, is *Anthomyia radicum*, a dipterous insect of the family *Muscidae*, and of the same genus with the Cabbage-fly and Beet-fly. It attacks the root of the turnip, as the Cabbage-fly does that of the Cabbage, the larva living in the root.

TURNIP SAW-FLY. See **SAW-FLY**.

TURNPIKE ROADS. See **HIGHWAY, TOLL**.

TURNPIKE STAIR, a turret stair revolving round a central newel.

TURNSOLE, a peculiar coloring material consisting of very coarse linen rags, usually pieces of sacking, prepared by cleaning and bleaching, and then dipped into the juice of the leguminous plant called *Crotophora tinctoria*, previously mixed with ammoniacal matter, and exposed to the air for some time. It is made in France, but is exclusively used in Holland, but for what is not certainly known: it is said, for coloring cheese, pastry, &c.

TURNSTONE (*Streptopelia interpres*), a bird of the plover family (*Charadriidae*), very widely distributed, and, indeed, found in almost every part of the globe. It appears in Britain chiefly as a winter bird of passage, but breeds in the Shetland Islands. It frequents the sea-shore, and derives its English name from its habits of turning over small stones with its bill in search of food. It is the only known species of its genus. The eggs, which are four in number, are laid on lonely rocky coasts where there is sparse vegetation. They vary very much in color and markings, and are cunningly concealed. The whole length of the T. is rather more than eight inches. The plumage varies with the age of the bird and the season. In August the plumage begins to get dull.

TURPENTINE is a semi-solid resin which is yielded by various species of pine, and by some other trees when incisions are made into them. The chief varieties of turpentine are *Common Turpentine*, yielded by *Pinus abies*; *Venice Turpentine*, yielded by the larch; *Bordeaux Turpentine*, yielded by *Pinus maritima*; and *Chian Turpentine*, yielded by *Pistacia lentiscus*. The Venice turpentine, which is regarded as the best variety, occurs as a clear, transparent, pale yellow, viscons mass, of a balsamic odor, and an acrid bliter taste, perfectly soluble in spirits of wine, and increasing in density on prolonged exposure to the air. On distilling it with water, it yields a considerable quantity of essential oil, vulgarly known as *spirits of turpentine*. This oil of turpentine (which, from its greater cheapness, is usually obtained from common turpentine) is, after rectification, represented by the formula $C_{20}H_{32}$, and has a spec. grav. of 0.864, and a boiling-point of 320°. It is colorless, transparent, has a strong refractive power, a strong peculiar odor, and a disagreeable acrid taste. It is readily soluble in alcohol, in ether, and in the fixed and essential oils, but is insoluble in water, on which it floats. It is a good solvent for many substances, amongst which may be especially mentioned sulphur, phosphorus, caoutchouc, and the various resins; and is largely used in many departments of the arts, forming a large proportion of all oil paints. Great quantities are imported into Britain from the United States, where it is mostly yielded by the Swamp-pine.

Turpentine is an energetic producer of Ozone (q. v.); and on keeping it for a long time in a stoppered flask, which should be occasionally shaken, the odor of ozone is very distinct on opening the vessel. Oil of turpentine forms three hydrates, of which two are solid. Commercial oil of turpentine often consists of a mixture of several isomeric hydrocarbons which act oppositely on polarised light (like the several varieties of sugar). Deville and Berthelot have ascertained that there are various modifications of which this oil is susceptible without its undergoing any change in its chemical composition. Of these, *isoterebenthene* and *metaterebenthene* differ *inter alia* in their boiling-points, and may thus be separated; *terebene* (which has an odor resembling that of oil of cloves) and *colophene* are obtained by acting on the oil with sulphuric acid; and *camphene* and *terebilene* by decomposing artificial camphor (which is a combination of the oil with hydrochloric acid) by means of quicklime.

Under the influence of nitric, hydrochloric, and sulphuric acids, chlorine, &c., oil of turpentine yields many products of interest to the chemist, but as yet of little practical value.

Oil of turpentine is used to a considerable extent in medicine, although, from its disagreeable taste, and from certain bad effects which occasionally follow its use (as stranguary, bloody urine, vertigo, a species of intoxication, and an eruption on the skin), it is often supplanted by less certain remedies. It is probably the most effective remedy for the expulsion of tapeworm, is nearly equally efficacious over the lumbrici or round-worms, and in the form of an injection is serviceable in the case of ascarides or thread-worms. For an adult, in a case of tapeworm or round-worm, the dose should be one ounce, combined with an equal quantity of castor-oil, or made into an emulsion with yolk of egg or mucilage. In the case of children and delicate women, it is better to try a milder vermicide (see VERMIFUGES). In doses of from two drachms to two ounces, and in similar combination with castor-oil, it may be given as a cathartic in cases of obstinate constipation, especially when dependent on affections of the brain; in hysteria, epilepsy, tympanitis, passive hæmorrhage, and in purpura hæmorrhagica, in which last-named disease Dr Neillan highly recommends it. In small doses (as from 10 to 20 minims), oil of turpentine is regarded as a diuretic; but it must be given with caution, in consequence of its stimulating properties. It is of more service in chronic mucous discharges of the genito-urinary organs, as gleet, leucorrhœa, &c., than in dropsy. In small doses, it is often useful in chronic rheumatism and in sciatica. In the Dublin school, it is much employed in small and repeated doses as a general stimulant in the low stages of continued fever. *Turpentine Punch* has long been a favorite remedy in the Meath Hospital (where Graves and Stokes made their reputation) in these cases. It is composed of an ounce of oil of turpentine, two ounces of brandy, eight ounces of boiling water, and a sufficient quantity of sugar. A third of this should be taken for a dose, and should be repeated if necessary every third hour. When applied externally, oil of turpentine is a speedy and powerful rubefacient and counter-irritant, and is beneficially used in this capacity in inflammatory attacks of the throat, chest, and abdomen. The best method to pursue is to rub the oil by means of a bit of flannel over the part to be acted on; over this to lay three or four folds of flannel, wrung out of hot water, and over the flannel to place a dry towel; two or three such applications produce a sufficient result. There is a *Liniment of Turpentine* which is powerfully stimulating, and is applied as a dressing for extensive burns; and is likewise used, with friction, in rheumatic and neuralgic cases. There is also the *Liniment of Turpentine and Acetic Acid*, which is the official representative of the well-known *St John Long's* liniment, and is an excellent counter-irritant (applied with a sponge) in pulmonary consumption and other chronic pulmonary affections. Lastly, *Ointment of Turpentine*, a warm stimulating application, requires mention.

It was mentioned at the beginning of this article that on distilling turpentine with water, the oil comes over. The residue left in the retort constitutes common resin (or rosin), known also as *colophony*. See RESINS.

TURPENTINE TREE. See PISTACHIA.

TURPIN, Archbishop of Rheims, friend and companion of Charlemagne, and eye-witness of the exploits he relates—such are the names and qualifications assumed by the author of a chronicle in Latin prose narrating the expedition of the

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Frankish emperor against the Saracens of Spain, and particularly the events that preceded and followed the battle of Roncevaux (q. v.). That a Bishop Turpin existed about this period, is admitted, but the very documents in which he is mentioned, state that he was slain at Roncevaux. There was also an Archbishop Turpin of Rheims (753—800 A. D.), but he has no claim to the description given above; and, in fact, all internal evidence leads to the conclusion that it is a work of the 11th century. It seems to have sprung out of the epic ballads and traditions of the Carolingian heroes, while these were still in a comparatively pure condition; but through the legendary manner in which they are told, there is visible a monkish aim—viz., to encourage the foundation of churches and monasteries, the undertaking of religious wars against the Saracens, and above all, the pilgrimage to San Jago de Compostella. Now, as in the year 1190, a brother of the Archbishop of Vienne (subsequently Pope Calixtus II.) obtained by marriage the countship of Galicia; as it was from Vienne that the pseudo-Turpin's chronicle was recommended to the rest of Christendom; as the same archbishop was detected on several other occasions fabricating false documents; as subsequently, in his quality of pope, he him- self pronounced the chronicle authentic in a bull of 1123 (the authenticity of which has, however, been questioned); as he pursued the same family policy in his acts as pope, and in his sermons in honor of San Jago; finally, as the chronicle of the pseudo-Turpin is very often followed in the MSS. by a dissertation of Calixtus upon the miracles of San Jago, it has seemed to critics highly probable either that Pope Calixtus wrote the work himself, while yet Archbishop of Rheims (circa 1090), or, at least, that he took an important part in its composition. The book soon acquired a great popularity, was translated into French after 1206, and was made use of by divers chroniclers, as the author or authors of the "*Chroniques de Saint-Denis*," Vincentius Bellovacensis, &c. The chronicle is of great historic value, in spite of all the embellishments it has from time to time received; for, as one of the most ancient traditions of the time of Charlemagne, it has preserved numerous traits and details with more purity and fidelity than the poems of the Carolingian cycle, which are generally of later date. The chronicle has been printed in Reubens's edition of the "*Scriptores*" (Hanau, 1619; Frank, 1726), but see more particularly Ciampi's "*De Vita Caroli Magi et Rolandi Historia, J. Turpino vulgo tributa*" (Flor. 1822).

TURPIS CAUSA, a phrase in the Law of Scotland, borrowed from the Roman law, to express an immoral consideration on which some contract or obligation is founded. The rule is, that when an immoral contract is broken, no court of law will assist either party to enforce it. Thus, if a man were to let lodgings to a prostitute, with the knowledge that the lodgings were to be used for carrying on her vocation, he would have no right to bring an action to recover rent.—The same is the rule in English law.

TURQUOISE, a mineral hitherto found only in the province of Khormasan, in Persia, and much prized as an ornamental stone. It is essentially a phosphate of alumina, containing also a little oxide of iron and oxide of copper. It is harder than felspar, but softer than quartz, and has a greenish-blue color. It is opaque, or sometimes translucent at the edges. It is sometimes called Oriental T.; whilst the name Occidental T. is given to a substance of similar color, found near Simon, in Languedoc, which is said to be merely bone colored with phosphate of iron.

TURRET-SHIP, the latest invention in naval warfare, consists of an iron-plated vessel rising but slightly above the water. In the middle of the deck are one or more turrets encased in the most massive plates, and holding each one or two guns of heavy calibre. The turret, in American vessels, is pivoted on the keel or other firm base; in English specimens it revolves on rollers under the periphery. By means of simple mechanism, it can be made, either by a steam-engine or by hand, to revolve with considerable speed, thus giving the gun a range in every direction. Turret-ships were first proposed in America, by Mr Theodore R. Timby, of New York, and were patented in this country by Captain Cowper Phipps Coles of the royal navy, who, after much discussion with the Admiralty, was allowed to adapt the *Royal Sovereign*, a wooden vessel which had been built for a three-decker, to his design. The plan was tried under disadvantages, as the ship had not originally been destined for such heavy work. Notwithstanding, the *Royal Sovereign*, as a turret-ship, was declared by competent officers to be at that time the most powerful

vessel in the British navy. Almost simultaneously in the United States, similar vessels, called "Monitors," sprang into existence, the principal point of difference between them and the British build being that their hulls are almost entirely submerged, the turrets being wholly above the upper deck; while, in the latter, the hulls rise higher from the water, and the turrets are sunk below the deck, except in so far as is absolutely necessary for discharging the ordnance. The British model gives the advantage of higher free-board, and consequent greater safety in heavy seas. Captain Cole lost his life in the greatest naval catastrophe of modern times, the capsizing of his great turret-ship, the *Captain*, with about 600 souls on board, in the Bay of Biscay, in September 1870. This vessel was built after his complete design; but naval architects attribute her loss to a low free-board, coupled with heavy masting. It has for several years been in dispute whether to trust to turret-vessels or to ships with their battery in broadside. Under the administrations of Lords Palmerston and Russell, the Admiralty built broadside vessels. Lord Derby's government signalized their accession to power in 1866 by immediately ordering four iron turret-ships of immense power and 4,000 tons each.

Among the advantages claimed for turret-ships are—that much heavier ordnance can be carried centrally than at broadside, with equal dislocating pressure on the keel; that in a sea the platform from which aim is to be taken is steadier at the centre; that the mark offered to the enemy is smaller; and that the gunners are safer, as the turret can be turned with its port-hole away from the enemy during loading. The *Devastation*, with her 35-ton guns, has been exceeded in power by the *Inflexible*, whose armor-plating, on ships, is two feet thick, and which is furnished with two turrets, each containing two 8-ton guns. Mr Rendel, upon whose principle the guns are mounted, uses hydraulic power, which enables the loading and firing to be conducted by two men only.

TURRET-SHELL, a family of gasteropodous molluscs, having a much elongated spiral shell, the lower spires remarkably separated. The name Turret-shell is often given to them.

TURTLE, the popular name of those Chelonian reptiles, the family *Cheloniadae* of some, which have a rather flat carapace, and fin-like paddles instead of legs, suited for swimming, and not for walking. The fore-limbs are much longer than the hind-limbs. The toes are not all furnished with nails; in some species, there is only one on each foot, in others there are two. Turtles are all marine, and although they lay their eggs on the beach, seldom visit the shore for any other purpose. They deposit their eggs in holes, which they scoop in the sand with their hind-feet. The eggs are numerous, one hundred and fifty or two hundred being often deposited at a time, and the T. lays several times a year. The young, soon after being hatched, make their way through the sand which covers them, and immediately betake themselves to the water. The eggs are hatched by the heat of the sand alone, and the young receive no attention from their parents. Turtles crawl slowly and awkwardly on the shore; but their movements in water are comparatively quick, and even graceful. Some of the species feed entirely on grass-wrack and sea-weeds, which their powerful, hard, and sharp-edged jaws cut with great ease; others prey on crustaceans, molluscs, and fishes. Their jaws are powerful enough to crush very large shells, and the carnivorous turtles are in general more rapid in their movements than the others. The flesh of those which subsist on animal food is musky and unpleasant; but that of the species whose food is vegetable is much esteemed. In many tropical countries, turtles, after being captured, are kept in enclosures to which the tide has access, to be killed when they are wanted. They are capable of subsisting long without food, and are imported alive from the West Indies into Britain, to supply the tables of the wealthy. In tropical countries, turtles are often very cheap. Their eggs are a much-esteemed article of food in the countries where they are found, and are sought for by probing the sand with a light stiff cane in the places known to be frequented by turtles. Turtles are easily taken when they come ashore for the purpose of laying their eggs, and one after another may be turned on its back—in which position it is helpless, and cannot make its escape—till a sufficient number is secured. They are also, however, taken in the sea, being cautiously approached by boats when resting, or apparently sleeping, at the surface, or by divers when described at the bottom in their feeding-grounds. A small harpoon is used, or a rope is thrown

Turtle
Tussac

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over the head of the turtle. Turtles are sometimes pursued by boats in shallow parts of the sea until they are exhausted, the clearness of the water permitting them to be seen even when they dive; and when the boat gets near enough, a man leaps overboard, and seizes the T., clinging with both hands to the shell. It is said that at Mozambique a species of sucking-fish (*Echeneis*) is used for catching turtles, a cord being attached to the fish, which is allowed to swim away in the sea, and is sure to fasten itself firmly to the first T. it meets.

The most esteemed T. of the West Indies is the GREEN T. (*Chelonia mydas*), which is the only kind imported into Britain for aldermanic and other feasts. The Green T. attains a large size, being sometimes six or seven feet in length, and weighing 700 or 800 lbs. The plates of its carapace do not overlap one another; the central ones are almost regular hexagons. The popular name is derived not so much from the external color, which is mostly a dark olive, passing into dingy white, as from that of the fat, so much prized by epicures.—Another excellent species of T. is the EMBLE T. (*Chelonia virgata*) of the East Indies, which is frequently four or five feet long.—The HAWKBILL T. (*Caretta imbricata*), found in the warmer parts of the Atlantic Ocean, in the Indian Ocean, and in the Red Sea, is particularly valuable, as yielding the best Tortoise-shell (q. v.). It is one of those turtles which have the plates of the carapace imbricated, or overlapping one another like tiles. Its flesh, although not so much esteemed as that of the Green T., is a good article of food; its eggs are also very good.—There are other turtles, having the head of a larger size, and the jaws curved towards one another at the extremity, of which one is the LOG-CRHEAD T. (*Couana olivacea*), a native of the warmer parts of the Atlantic, and a very rare visitant of the British Seas. Others, again, have the carapace and plastron not hard, but leathery, and sometimes soft enough to yield to the pressure of the finger. One of these is the CORIACEOUS T. (*Sphargis coriacea*) of the Mediterranean and Atlantic, occasionally, but rarely, found even on the British shores. It attains a very large size, even greater than any of the species already described, but its flesh is coarse and unpleasant.

The French, encouraged by their success in pisciculture, have attempted to introduce the Green T. on the southern coasts of France. There has not yet been time to prove the success of the experiment.

TURTLE-DOVE, or Turtle (*Turtur*), a genus of *Columbidae*, having the bill more slender than pigeons, the tip of the upper mandible slightly bent down. They are also more slender and elegant in form than pigeons, and generally smaller; the wings are longer and more pointed; and the tail is longer, rounded or slightly graduated. There are numerous species, natives of warm climates. Their soft and gentle, yet loud cooing has attracted attention even more than their beauty, and made them a favorite subject of allusion in poetry. *T. risorius*, the most common species in Palestine, and probably the one intended in the Song of Solomon, is about ten inches in entire length, with a short tail; the general color grey tinged with red; the upper parts greenish brown, with a black collar on the back of the neck. It is often kept in confinement, and becomes very tame.—Very similar to this in size and form is the COMMON TURTLE-DOVE (*T. communis*), a native of almost all the warmer parts of the Old World, a summer visitant of the south of Europe and of England, where it is chiefly found in the south-eastern counties. In Kent, flocks of twenty or more are often to be seen, particularly in the pea-fields. The tail is long, and much rounded; the plumage soft, and without gloss, exhibiting finely-mingled tints of gray and brown; the crown of the head bluish; all the tail-feathers tipped with white; a black patch on each side of the neck. Other species of turtle-dove, from different parts of the world, as well as these, are not unfrequently kept in confinement, and are very gentle, if not very intelligent pets. Their cooling resonance through a whole house.

TUSCAN ORDER OF ARCHITECTURE, one of the five Classic Orders (q. v.), being a Roman modification of the Doric style with unfuted columns, and without triglyphs. It is the simplest of the orders.

TUSCANY, formerly a sovereign grand duchy in the west of Italy, lying for the most part, but not wholly, south and west of the Apennines, in lat. 42° 30'—44° 10' n., and long. 10° 15'—12° 20' e. Area, 8440 sq. m.; pop. in 1800, at the date of its annexation to Sardulia, 1,800,000; (1871) 1,988,810. The north and north-east of

the country is filled with mountains, whence numerous rivers and streams flow down to the sea, the most important of which are the Arno (q. v.), the Serchio, and the Ombrone. This district is also the source of the Tiber (q. v.). The rest of T. is an undulating region of hills and dales, except the coasts, which are flat and marshy. Of these marsh-lands, the largest is (or was) the *Maremma* (q. v.). The principal crops are maize, wheat, rye, and barley. Wine and oil are also abundantly produced. Mules, cattle, and sheep are reared in great numbers; there are flourishing manufactures of silks, woollens, and straw (for hats); and a very considerable trade is carried on in articles in marble, alabaster, porcelain, coral, wax, &c. The chief town, Florence, was for a time the capital of Italy. Other important places are Leghorn, Pisa, Siena, and Arezzo.

The ancient history of T. is described at length in the article *ETRURIA*, and its medieval history in the article *FLORENCE*. It is only necessary to add, by way of elucidation, that modern T. was first constituted in its present dimensions in 1569, when Cosimo de Medici became Grand Duke of Tuscany. On August 16, 1860, the national assembly of T. pronounced the deposition of the reigning dynasty; and four days later, declared for annexation to Sardinia.

TUSCARORAS, a tribe of North American Indians, who, at the settlement of North Carolina, had 15 towns on the Tar and Neuse rivers, and 1200 warriors. In 1711, they began a war with the settlers, and after a series of savage encounters, were defeated, and joined the Iroquois in New York, where they became allies of the English, and where about 50 families still reside on an Indian Reservation in the western part of the state.

TUSCULUM, anciently a city of Latium, about 15 miles south of Rome, was situated on a ridge of hills known as the *Colles Tusculani*, and forming part of the Alban range. We ought not to infer from its name (as Festus does, *s. v. Tuscos*) that it had any connection with the Etruscans. Mythically, it derived its origin from Telegonus and Circe; but we catch the first certain glimpse of its historical existence towards the close of the regal period at Rome. Then, however, it appears in the enjoyment of a high degree of prosperity and power, and there fore its beginnings are in all probability remote. Octavius Mamilius, ruler of T., and the foremost prince in Latium, married a daughter of Tarquin the Proud (see *TARQUINIUS*), and played a conspicuous part in the last of the great struggles made by the banished tyrant to regain his kingdom. On that occasion, the Latins were so thoroughly beaten (see *REGILLUS LAKE*) that they were fain to enter into an alliance with the victor, and ever after—except in the single instance of the Great Latin War (340—338 B.C.)—remained steady in their attachment and fidelity to Rome. As early as 378 B.C., the inhabitants of T. received the Roman franchise, and among its many distinguished *gentes* may be specially mentioned the Porcian, which produced two famous men of a thoroughly "Roman" stamp, Cato Major and Cato Minor. Towards the close of the Republic, T. became a favorite country residence of the wealthy Romans. Lucullus had a villa here (with parks and gardens extending northwards for miles); so had Cato, Brutus, Hortensius, Crassus, Cæsar, and Cicero. The villa (*Tusculanum*, Tusculum House) of the great orator is peculiarly memorable as the place where he composed many of his philosophical works, and particularly those charming dialogues ("Tusculanæ Disputationes") which derive their name from it. Long after the Western Empire had fallen, T. continued to flourish. As late as the 12th c. the ancient city continued entire; but in 1191 it was stormed by the Romans (between whom and the Tusculans there had long been a deadly feud), and razed to the ground. It never recovered from this blow; but lower down there arose from its ruins, if we may so speak, the town of Frascati (q. v.). Many fine remains of ancient T. have been dug up in recent times, the most remarkable, perhaps, being the amphitheatre, theatre, and city walls.

TUSSAC GRASS (*Dactylis cæspitosa*), a large grass of the same genus with the Cock's-foot Grass of Britain, a native of the Falkland Islands, remarkable for forming great tufts, sometimes five or six feet in height, the long tapering leaves hanging over in graceful curves, from five to eight feet long, and an inch broad at the base. It is, however, sufficiently delicate to be very good food for horses and cattle; and the attention of British farmers having been very strongly called to it, it has been tried with success in the Hebrides, Orkney Islands, and other localities in which there is a peaty soil, exposed to winds loaded with sea-spray, to which it promises

Tussilago
Tw Weed

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to be a very valuable acquisition. The inner part of the stem, a little above the root, is soft, crisp, flavored like a hazel-nut, and often eaten by the inhabitants of the Falkland Islands. The young shoots are boiled and eaten as asparagus.

TUSSILA'GO, a genus of plants of the natural order *Compositæ*, sub-order *Corymbifera*, having bractæ, with a membranous edge, a naked receptacle, a hairy pappus; the florets of the ray pistilliferous, in many rows, tongue-shaped; those of the disc perfect, few. *T. Farfara*, sometimes called **COLT'S-FOOT**, is the only British species. It has single-flowered scaly scapes, appearing before the leaves in early spring, the flowers yellow, both disc and ray; the leaves heart-shaped, angular, downy beneath. The leaves have a somewhat glutinous and subacid taste, and are used either by smoking, or in the form of a decoction, for relief of asthma and troublesome coughs. They have been used with advantage in scrofula.—Nearly allied to this genus is *Petasites*, of which one species, the **BUTTER-BUR** (*P. vulgaris*, formerly *Tussilago Petasites*), is a native of Britain. The leaves resemble those of *Tussilago Farfara*, but are much larger; the flowers also appear before the leaves, but in a dense thyrsus, and are of a pale flesh-color. The flowers of both are much sought after by bees, as are those of *Petasites* (formerly *Tussilago*) *alba*, and *P.* (formerly *T.*) *fragrans*, natives of the south of Europe, not uncommon in our flower-gardens.

TU'SSOCK MOTH (*Larix pudibunda*), a grayish white moth, about an inch long, the upper wings checkered, with four irregular darkish lines, the under wings nearly white. The caterpillar does great mischief in hop plantations, and is known by the name of *Hop-dog*.

TUTOR, in the Law of Scotland, means a guardian of the person as well as of the estate of a boy under 14, or a girl under 12; that is, while they are in a state under that of puberty. At common law, a father is both tutor and curator of his children. Tutors are divided into three kinds: tutors nominate, tutors at law, and tutors dative. A tutor nominate is he whom the father, who has the sole power of naming a tutor, has appointed by will or deed. Sometimes several are appointed to act jointly. In general, no security is required from a tutor nominate, because the father's choice implies that the tutor is a trustworthy person. Yet, if he is *vergens ad inopiam*, or of doubtful character, security will be required. Tutors at law are those whom the law will appoint in a certain order of relationship, if there is no tutor nominate. No cognate, i.e., no relation by the mother's side, will be appointed; but the nearest agnate, i.e., a person related through the father, will be appointed, if a male, and of the age of 25, and able to give security. The tutor, however, has only the custody of the pupil's estate, while the custody of the pupil's person is given to the mother or nearest cognate. A tutor dative is named by the crown when there is no tutor nominate or tutor at law. Tutors other than tutors at law have the custody of both the person and estate of the pupil, and act alone for the pupil, suing for and discharging all debts due, and managing the property. The tutor's office is gratuitous, and he is not allowed to derive any profit from it, or to do acts inconsistent with his duty. For some purposes, however, such as selling the pupil's land, he must have the sanction of the Court of Session. He is bound, on entering office, to make up an inventory, and must keep proper accounts.

TU'TTLINGEN, a town of Württemberg, on the right bank of the Danube, 20 miles west-south-west of Sigmaringen. It has manufactures of knives, needles, cloth, cotton, hosiery, linen, and silk, and carries on besides some trade in corn. Pop. (1875) 7515. T. is historically notable as the scene of a battle in 1648, during the Thirty Years' War, in which an Austro-Bavarian force, under Hatzfeld and Mercy, defeated the French.

TUTTY-POWDER, an impure oxide of zinc, which is found in the chimneys of the furnaces in which the ores of that metal are roasted. It has some value in medicine.

TUTUI'LA, an island in the Pacific, belonging to the group of the Navigators' or Samoan Islands (q. v.), is about 17 miles long and 5 miles broad, and is said to contain nearly 5000 inhabitants. The coast is bold, and the island is traversed by sharp-peaked mountains, highly picturesque in outline, and rising to from 2500 to 3500 feet. The harbor of Pago Pago, an ancient crater, is very deep, and completely

landlocked by lofty mountains. The mountains are clothed with dense green forests, comprising the bamboo, banana, cocoa-nut tree and other palms. Between the months of November and May, fearful hurricanes break over the island, and so powerful is their effect, that they are said by the natives to *skin the land*.—"Cruise of H.M.S. *Fawn*," by T. Hood (Edmonston and Douglas, Edin. 1863).

TU'YERE, the nozzle or small pipe through which the air is forced into a blast-furnace.

TVER, a government of Great Russia, bounded on the n.w. by the government of Novgorod, and on the s.e. by those of Moscow and Smolensk. Area, 25,080 sq. m.; pop. (1870) 1,525,881, mostly Russians. In configuration, the government is an elevated table-land, forming part of the Valdai plateau, which throws off rivers that run north-west into the Baltic, and south-east into the Caspian Sea respectively. The chief rivers are the Volga, with its affluents, the Tveriza and the Mologa; the Western Dwina, the Msta, and the Tsna. Most of these rivers rise in the north-west of the government, where there are numerous lakes. The climate is somewhat severe: the soil is not fertile, the most of the government being in marshes, and in woods and tracts of turf, the working of which, however, is as yet insignificant. Rye and oats are the only cereals produced with success. The employments of the inhabitants are principally agricultural; but other modes of industry are gradually developing themselves, especially along the great commercial highways of the government; 50,000 men are employed in the lake-fisheries, which are important, and in the conveyance of goods.

TVER, a city of Great Russia, capital of the government of the same name, stands at the confluence of the Volga with the Tveriza, 248 miles south-east of St Petersburg, by the St Petersburg and Moscow Railway. The Volga, which is here wider than the Thames at London Bridge, becomes first navigable for steamers at this town, although there is much difficulty in accomplishing the voyage hence to Nijni-Novgorod, when the water is low. Among the important buildings of T. are 2 monasteries, 13 churches, and 47 factories of different kinds, of which the chief is the cotton mill of Kaonlin and Zologin, in which 1500 people find employment. Nail-making is an important branch of industry. The situation of T. is very convenient as a landing-place, in consequence of the St Petersburg and Moscow Railway here meeting the Volga, the principal artery of the commerce of the interior of Russia. The commercial prosperity of the town is continually increasing. Cereals and iron brought from Siberia are the chief articles of commerce, and besides the articles already mentioned, linen, leather, and paper are largely manufactured. Pop. (1867) 29,896.

TWEED, the most famous of Scottish rivers, rises in the extreme south of Peeblesshire, at an elevation of 1600 feet above sea-level. It flows north-east to near Peebles, thence east by south to its junction with Etrick Water, and thence in an easterly and finally north-easterly direction to its embouchure in the North Sea at Berwick-on-Tweed. The river drains great part of Peeblesshire, traverses the northern districts of Selkirk and Roxburgh shires; and in its lower course it forms the boundary between Berwickshire on the north-west and the English borderland on the south-east. It receives the Etrick, the Teviot, and the Till from the south; and the Gala, Leader, and Adder from the north. The T. passes Peebles, Innerleithen, Melrose, Dryburgh Abbey, Kelso, Coldstream, and Berwick, where it falls into the sea after a course of 96 miles, and having drained an area estimated at 1870 sq. m.—greater than that of any other Scottish river, except the Tay. The highest regions through which the river flows are for the most part of the nature of moors; the middle course of the river is through narrow valleys, flanked by hills, clothed with woods or in pasture; and its lower course, through widespread valleys, picturesque and beautiful, and through the rich plain of the Merse (see BERWICKSHIRE), has many attractions. The tide is felt at Norham Castle, ten miles from the mouth of the river; but there is little or no navigation above Berwick. Possibly the T. owes its fame more to the associations which connect themselves with it, than to the charms of the scenery through which it flows. Traversing the heart of the "Border," it has been witness to many a foray between the warrior-farmers north and south of its banks, as well as many a deadly struggle between the rival Houses of the

Tweedmouth
Twelve

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south of Scotland; and its name is frequent in ballad and story. The T. is famous as a salmon and trout stream.

TWEE'DMOUTH. See **BERWICK-ON-TWEED.**

TWEEDS, a name originally given to a certain kind of woollen cloth, produced in the south of Scotland, largely made at Galashiels, Hawick, Selkirk, Jedburgh, and other places on the Tweed and its tributaries. It is prepared chiefly for men's apparel, but its use and consumption for women's wear has of late been steadily on the increase. It is of an open, soft, flexible nature; differing from English superfine cloth in not being so finely spun or closely woven, and most of all in not being so thoroughly felted. The fabric of broad-cloth is not intended to shew any appearance of weaving, whereas in tweeds, starting from the "shepherd's plaid," the whole art of weaving is capable of being developed in novel and fanciful designs, admitting of great variety of texture. Tweeds are further characterised by their purity of color and genuineness of make—shoddy, mungo, and cotton-warp not being yet used in the production of even the cheaper kinds. It is a manufacture of comparatively recent date. Seventy-five years ago, Galashiels, a principal seat of the manufacture, was only a small village; its few weavers individually manufacturing a species of coarse woollen cloth called "Galashiel gray," made from wool grown on the surrounding hills. About forty years later, the fabric was so far improved, that its use was no longer confined to the Border shepherds, but it had begun to be more or less worn by all classes in towns. The warmth, comfort, and durability of tweeds, as well as their suitability for all seasons, gradually led to their being preferred to the hard tartans, Manchester linens, and Nankeens of former days; and eventually, even to English doeskin. The demand for them rapidly increased. Galashiels has become a considerable town, and many large mills are now in active operation on the Tweed and its "waters," although they have for many years ceased to furnish power enough for the machinery. Nor has the manufacture confined itself to Tweedside, but has spread northwards to Aberdeen, Elgin, and Inverness; and southwards to Dumfries, and into Cumberland. The wools used in the production of tweeds are principally Cheviot, South American, and Danish for the coarser kinds; and Australian, New Zealand, and Saxony for the better qualities. The processes of spinning and weaving are similar to those adopted for English woollen cloth, the machinery, in fact, being, in the main, exactly the same. A great impetus was given about the year 1853, by improved wool washing and drying machinery, and especially the successful introduction of self-acting mules for the drawing and spinning of the yarns direct from carding-engine, condenser, and rovings. More recently, in order to a division of labor and capital, factories have been erected for spinning only, and others for weaving and finishing. This manufacture, now one of the great staples of Scotland, is rapidly increasing. The following figures exhibit the advances made in Scotland in the manufacture of fabrics of this class from 1851 to 1862:

	1851.	1862.
Number of Factories.....	72	89
" Power-looms.....	829	1069
Sets of Carding-engines.....	225	305
Value of Goods made, about.....	£600,000	£1,600,000

As respects the progress made since 1862, it may be stated that, according to an estimate made in 1878, the annual value of tweeds made in Galashiels and its neighborhood amounts to about £1,500,000. The value of such goods now produced in all Scotland must therefore be nearly £3,000,000. Such has been the success of this article, that it is largely imitated in the English manufacturing districts, in all qualities of material.

The Jury Report on the woollen goods exhibited in the International Exhibition of 1862, remarks: "To the Scotch manufacturers belongs the credit of having found out what the public like, and of having led for a considerable period the public taste. So largely have their productions been imitated on the continent, that many of the choicest fancy trousseings of France and other countries are easily traceable in design and coloring to their Scotch origin."

TWELFTH-DAY. See BEAN-KING'S FESTIVAL, and EPIPHANY.

TWELVE TABLES (Lat. *Lex* or *Leges Duodecim Tabularum*), the name given to the earliest code of Roman law. According to the ancient account, the code originated in this wise: In the year 462 B. C., a tribune, C. Terentilius Arsa, brought forward a proposal to appoint five men to draw up a set of laws, with the view of limiting the *imperium* of the consuls. The aristocracy, always furious, selfish, and unwise in their struggles with the commons of Rome, violently resisted this reform, and for eight years a fierce parliamentary warfare—if we may so call it—was carried on between the two orders, which ended in a sort of partial victory for the plebeians; that is to say, in 454 B. C., the senate assented to a *Plebiscitum* (see **PLEBISCITE**), in virtue of which three commissioners were despatched to Greece to report on the laws in force among the different States there. After a lapse of two years, they returned; and it was then agreed that ten men (*decemviri*) should be selected to draw up a code (*legibus scribundis*); but the patrician or aristocratic party took care that these decemvirs should all be chosen from their body. The story of the political fortunes of the Decemviri (q. v.), and of the fate of the leading decemvir, Appius Claudius (q. v.), are well known, though we believe that it has not come down to us in a very historical dress; indeed, it is politically quite unintelligible in the main. But what concerns us here is not the political career of these men, but the character of the legislation ascribed to them. We say ascribed to them, for the whole story of the foreign travels of the commissioners, and of their eclectic procedure in the matter of the Solonian and other laws, is so completely at variance with the simple, narrow, home-centred feelings of the Roman people at that early time, and with the thoroughly *Italian* stamp of the legislation embodied in the "Twelve Tables," that it has very reasonably been doubted whether such a commission ever existed, or, if it did, whether it did not acquire its information from the Hellenic cities of Lower Italy. Niebuhr, however, thinks the embassy to Greece just possible, though he is obviously reluctant to go further, and affirm that it really did occur ("Lect. Rom. Hist.," vol. I. p. 296), and points out very clearly the difference between the Roman and Greek laws. "All," says he, "that is distinctive in the Roman law, is not to be found in the Athenian; and distinctive it is with regard to the rights of persons and things. Never had the Greeks the right of paternal authority, like the Romans; never the law, that the wife, by her marriage, entered into the relation of a daughter and co-heiress; never the *jus mancipii*, the formality in the purchase. The difference between property by formal purchase and simple property, between property and hereditary possession, does not exist in the Attic law; the Roman law of inheritance, the Roman law of debt, the Roman system in contracts of borrowing and lending, are quite foreign to the Athenians" ("Lect. Rom. Hist.," vol. I. pp. 295, 296). These differences, and the number could easily be enlarged, have induced modern historians to adopt the theory—if, indeed, that should be called a "theory" which, in the eyes of all sound investigators, is a demonstrated fact—viz., that the Twelve Tables, instead of being an eclectic assortment of foreign laws, hitherto unknown to the people of Rome, and imposed on them for the first time, really expressed the first effort towards the codification of the consuetudinary law of the Latin race.

According to Livy (iii. 57) and Diodorus (xii. 56), the laws of the Twelve Tables were cut on bronze tablets (whence their name), and put up in a public place. Whether these tablets were destroyed by the Gauls when they sacked and burned Rome (390 B. C.), is uncertain. At all events, the later Romans entertained no doubt that the collection which existed in their time was genuine. The only portions extant are those which have been quoted by jurists and others. The Twelve Tables is described by Livy (iii. 34) as the *fontes publici privateque juris*—the fountain of public and private law. Cicero ("de Or." i. 43, 44) speaks of them with high praise. In the course of years, the "*Jus Publicum*," as could not fail to be the case, was greatly changed, but the "*Jus Privatum*" of the Twelve Tables continued the fundamental law of the Roman state. See George Long's article "*Lex*," in Smith's "*Dic. of Gr. and Rom. Ant.*"; Niebuhr's "*Lect. Rom. Hist.*" (English translation, vol. I. pp. 295–319), Mommsen's "*Hist. of Rome*" (English translation, vol. I. book I. chap. 11, and book II. chap. 2). The most complete essay on the history of the extant fragments of the Twelve Tables is to be found in Dirksen's "*Uebersicht der bisherigen*

Verſuche zur Kritik, und Herſtellung des Textes der Zwölf-Tafel-Fragmente" (Leip., 1824).

TWILIGHT. If the earth had no atmosphere, we ſhould be involved in total darkness from the inſtant of ſunſet till the inſtant of ſunriſe. The tranſition from day to night, and from night to day, occupies an interval which varies with the latitude and the declination of the ſun, and this intermediate ſtage is called twilight. As long as the ſun is not more than 18° below the horizon, its light is reflected by the air and the clouds and vapors ſuſpended in it, in ſufficient quantity to render even diſtant objects viſible. The queſtion of the duration of twilight is, therefore, ſimply reduced to this: How long, after ſunſet, or before ſunriſe, does the ſun reach a poſition 18° below the horizon of a given place? The ſun's greateſt declination is about $23^{\circ} 30'$, and therefore, in lat. $45^{\circ} 30'$ ($72^{\circ} - 23^{\circ} 30'$), there will be one night in the year (at the ſummer ſolſtice) conſiſting wholly of twilight; for higher latitudes, more; and for lower, none. Some curious problems on this ſubject, ſuch as the finding the time of year at which the twilight is longeſt in a given latitude, were among the early triumphs of the differential calculus. A curious phenomenon, known as the *afterglow*, or ſecond twilight, often ſeen in the Nubian deſert, is referred by Sir John Herſchel to a ſecond reflection of ſolar light in the atmosphere. Lambert and others had previously ſpeculated on the poſſibility of ſecond and even third twilights, but in their time there was no recorded obſervation of ſuch appearances.

Attempts have been made to deduce from the duration of twilight the height of the earth's atmosphere; and from various measurements which have given reſults agreeing fairly with each other, 50 miles has been aſſigned as a probable value. But, till we know more of the law of temperature in the atmosphere, we have no very direct means of teſting the correſtneſs of ſuch reſults. In all probability, they are too ſmall, as, indeed, we might expect, if we ſuppoſe the higher regions of the atmosphere to be much attenuated, and, therefore, reflecting little light. Beſides, the ignition of meteorites is believed to have taken place at altitudes of more than 50 miles; and auroral arches have been obſerved at leaſt 60 miles high.

TWILL, a woven fabric, in which the warp is raiſed one thread, and depressed two or more threads for the paſſage of the weft: this gives the ſtructure a curious appearance of diagonal lines.

TYBEE, an iſland and ſound at the mouth of the Savannah River, Georgia, U. S. The ſound is a bay of the Atlantic, extending from Tybee Iſland on the ſouth to Hilton Head on the north, opening to Port Royal entrance by Cooper's River, Wall's Cut, Lizardo Creek, and other channels. The iſland is ſix miles long by three wide; and was occupied in 1861 by General Sherman, who erected batteries for the reduction of Fort Pulaski, which capitulated April 11, 1862.

TY'BURN, previously to 1783, the chief place of execution in London, was ſituated near the north-eaſtern corner of Hyde Park, at the weſtern extremity of Oxford Street, and at the point where the Edgware and Uxbridge Roads unite. It took its name from a ſmall ſtream which ran from Hampstead to the Thames, through St James's Park, but which has long ſince diſappeared. The gallows ſeems to have been a permanent erection, reſting on three poſts, whence the phraſe "Tyburn's triple tree." Wooden galleries were erected near it for the accommodation of ſpectators. Hogarth's *Idle Apprentice* was executed at Tyburn; and the print which repreſents the ſcene, gives a good idea of an execution there. The criminal was conveyed all the way from Newgate to Tyburn, a diſtance of about two miles, by Holborn and the Tyburn Road, now Oxford Street, but in the 17th c. a "ſloughy country road." As Oxford Street and London generally eſtended weſtward, the long proceſſion became inconvenient, and the place of execution was, on 9th December 1783, removed to the Old Bailey, or Newgate, where it has ſince remained.

In early times, the frequency of executions rendered the office of hangman more important than it has ſince become. Throughout the reign of Henry VIII (88 years), the average number of perſons executed in England was 2000 annually. In our own time, the correſponding number has ſunk to twelve. Formerly, the hang-

man must have had almost daily work. This fact, taken in connection with the increase of population, and the employment of the Tyburn hangman in state executions, explains the important place he occupied in popular imagination, and the frequent mention of him in contemporary literature. The first on record was "one Bull" who flourished in 1593. He was succeeded by Derrick, referred to in the "Fortunes of Nigel," and mentioned in a political broadside as living in 1647. In the ballad of "The Penitent Tailor," published in the same year, reference is made to his successor, Gregory Brandon—

"I had been better to have lived in beggary,
Than to have fallen into the hands of Gregory."

In Gregory's time it became the custom to prefix "esquire" to the names of the Tyburn hangmen. This is said to have originated in a practical joke played upon the Garter King-of-arms. He was induced to certify the authenticity of a coat-of-arms of a gentleman named Gregory Brandon, who was supposed to reside in Spain, but who turned out to be the hangman. The Garter King was committed to prison for his negligence, and hence the popular error, that "an executioner who has beheaded a state prisoner becomes an esquire." Gregory was succeeded by his son Richard. "Squire Dun" followed; and after him came Jack Ketch, or Squire Ketch, first mentioned in 1678. He was the executioner who beheaded Lord Russell and the Duke of Monmouth. Lord Macaulay, in speaking of the execution of the latter, says: "He then accosted Jack Ketch, the executioner, a wretch whose name has, during a century and a half, been vulgarly given to all who have succeeded him in his odious office. 'Here,' said the duke, 'are six guineas for you. Do not back me, as you did my Lord Russell. I have heard that you struck him three or four times. My servant will give you some gold, if you do the work well.'"—See "History of England," vol. ii. p. 205. What followed, it is needless to repeat. After this time, the "kings of Tyburn" all received the name of Ketch, and their patronymics seem to have been less noted. Jack Ketch's immediate successor was "one Rose, a butcher;" and the last of the Tyburn hangmen was Edward Dennis, condemned for taking part in the No-Popery Riots, but respited, it is believed, on the ground that his services could be ill dispensed with.

Among the most memorable executions at Tyburn were those of Elizabeth Barton, the Holy Maid of Kent, and her confederates (1584); John Felton, the murderer of the Duke of Buckingham (1628); Jack Sheppard, the highwayman (1724); Jonathan Wild, the thief-catcher (1725); Mrs Browning, the murderer of an apprentice (1766); Dr. Dodd (q. v.), found guilty of forging a bond for £4200 (1777); and the Rev. Henry Hackman, murderer of Miss Reay (1779). The associations connected with Tyburn have naturally led to the suppression of the name in the street nomenclature of London; but it survives in that given to the quarter of the metropolis described by Mr Thackeray as "the elegant, the prosperous, the polite Tyburnia, the most respectable district in the habitable globe."—See Chambers's "Book of Days," vol. ii., and "Notes and Queries," 2d series, vol. ii.

Under a statute of William III. (10 and 11 c. 23, s. 2), prosecutors who secured a capital conviction against a criminal were exempted from all manner of parish and ward "offices within the parish in which the felony had been committed." Such persons obtained what was called a "Tyburn ticket," which was enrolled with the Clerk of the Peace, and sold like any other property. The privilege the tickets conferred must have been highly valued, as they sold at a high price. "Last week," says the "Stamford Mercury" of 27th March 1818, "a Tyburn ticket sold in Manchester for £280." The act under which they were granted was, however, repealed a few months later, by 58 Geo. III. c. 70, passed 3d June 1818; and since then they have ceased to be recognised.—See "Notes and Queries," 2d series, vol. xi.

TYE, Christopher, an English musician of note of the 16th century. He was born in Westminster in 1500, educated in the King's Chapel, and held the office of musical instructor to Edward VI. when Prince of Wales. He received the degree of Musical Doctor from the university of Cambridge in 1545, and from Oxford in 1548. Under Elizabeth, he was organist to the Chapel Royal, and produced various services and anthems, some of which are yet in repute among musicians. Dr T.'s general scholarship was considerable.

Tyldesley
Tyndall

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TYLDESLEY, a well-built and increasing town of Lancashire, England. Pop. (1871) 6408.

TYNDALE, or **Tindale**, William, an eminent English reformer and martyr, well known as a translator of the Bible, was born about 1484. He was educated first at Oxford, and afterwards at Cambridge, and was, from his youth, as Foxe says, "singularly addicted to the study of the Scriptures." After leaving Cambridge, he became tutor and chaplain in the house of Sir John Walsh, a knight of Gloucestershire, where he frequently engaged in religious disputes with the clerical dignitaries of the neighborhood, and soon incurred their wrath by what they deemed the heresy of his opinions. He went to London about the middle of 1525, bent upon the fulfilment of his long-cherished desire of translating the New Testament into English. Failing, however, to obtain the patronage he expected in carrying out his intention, he retired to Germany in 1524. Here his translation of the New Testament was published in 1525 or 1526, and conveyed into England. This work, although denounced by government, was yet so eagerly received by the English, that several reprints of it were produced by the Dutch printers within the next few years. T. continued on the continent, writing tracts in advocacy of the reformed doctrines; in 1530 he published a translation of the Pentateuch, and in 1531, one of the prophet Jonah. In 1533 he took up his abode in Antwerp, where, in 1534 and 1535, he published two revised editions of his New Testament. In 1535 he was treacherously arrested, and, after a confinement of 16 months, was publicly strangled and burned as a heretic at Antwerp in 1536.

T. was a man of great learning as well as talent, and his own writings, in addition to his translations, show how well adapted he was for the great work of his life, so fearlessly carried out. Our modern version of the New Testament is substantially T.'s translation with modernised spelling. See "William Tyndale," by Rev. R. Demaus, M. A. (1871).

TYLER SURRECTION. A poll-tax of three groats, imposed in 1381, during Richard II.'s minority, to defray the expenses of the war with France, roused the spirit of resistance among the common people. An insult offered by one of the tax-gatherers to a blacksmith's daughter in Essex, led to the first open outbreak. The populace rose everywhere, and under the conduct of two peasants, named **Wit Tyler** and **Jack Straw**, they mustered in great force at Blackheath, committing violence on all who came into their hands. They had an interview with the king, who, finding resistance vain, promised acquiescence with their demands, which included a general pardon, freedom of commerce, and the abolition of villeinage. Meantime, a party of insurgents had broken into the Tower, and murdered the Primate and Chancellor, and the Treasurer. The king, encountering Tyler at the head of the rioters in Smithfield, invited him to a conference, when he conducted himself with an insolence that led Walworth, the mayor, to dispatch him with a dagger. The king immediately, with great presence of mind, offered himself to lead the populace, and leading them to the fields at Islington, where a body of troops had been collected for his Majesty's protection, ordered the rioters to disperse. The revolt, however, was not extinguished without considerable bloodshed.

TYLER. John, tenth President of the United States, born in Charles City county, Virginia, March 29, 1790. His father was an officer of the army in the Revolution, and a judge of the Federal Court of Admiralty. John entered William and Mary College at 12, and graduated at 17, was admitted to the bar at 19, and almost immediately entered upon a large practice. At 21, he was elected to the state legislature, supporting the policy of Jefferson, Madison, and the Democratic party. He was almost unanimously elected five times; and in 1816, entered Congress. During his long congressional career, he sustained all the measures of the State Rights party. In 1825, he was elected governor of Virginia; and in 1827, senator in Congress. He supported General Jackson and the Democratic policy; but sided with Mr Calhoun on the question of nullification. At a later period, however, 1833-1834, he supported Mr Clay's resolutions of censure on General Jackson for removing the government deposits from the United States bank. From this period, he became an active partisan of Henry Clay, the candidate of the Whig or Republican party; and in 1840, was elected Vice-president of the United States, with General Harrison as President. President Harrison died April 4, 1841, a month after his inauguration, by which

event, Mr T. became President. He began his administration by removing Democrats from office, and appointing Whigs, and pronouncing in favor of Whig measures, but soon after vetoed a bill for a United States bank, passed by Congress; several members of the cabinet resigned; and after some changes, John C. Calhoun, the great Southern Democratic statesman, became Secretary of State. The most important act of his administration was the annexation of Texas, March 1, 1845. At the close of his term of office, he retired to private life until 1861, when he was President of a Peace Convention at Washington. Failing in his efforts at a compromise, he gave his adhesion to the Confederate cause, and was a member of the Confederate Congress until his death, at Richmond, Jan. 1862.

TYLO'PHORA, a genus of plants of the natural order *Asclepiadaceæ*, natives of the East Indies, New Holland, &c., with a wheel-shaped corolla, and a 6-leaved fleshy coronee. *T. asthmatica*, a native of the coast of Coromandel, has a high reputation as a medicinal plant. Its root possesses properties similar to those of *ipocatanha*, and has been found of great use in dysentery.

TYMPANUM (Lat. a drum), in Anatomy, the middle ear (see **EAB**). In Architecture, the flat space left within the sloping and horizontal cornices of the pediment of Classical Architecture, usually filled with sculpture (see **GREEK ARCHITECTURE**;) also, the space between the arch and lintel of doorways in Gothic Architecture, which is frequently enriched with sculpture.

TYNDALL, John, physicist, was born 21st Aug. 1820, at Leighlin Bridge, County Carlow. He had few educational advantages. On returning from the continent, where he received part of his education, he found employment in one of the subordinate grades of the Ordnance Survey. He was afterwards appointed Teacher of Natural Philosophy at Queenwood College, Stockbridge, and there commenced those original investigations which have distinguished him among the explorers of science.

In January 1853, T. communicated his paper to the Royal Society, "On Molecular Influences"—"Transmission of Heat through Organic Structures." It exhibits much of that skill in experimenting and fertility of resource which characterize his subsequent researches, and illustrates certain important questions in natural philosophy.

Year by year from the date above mentioned, T. has extended our knowledge of science. His field of research is wide and varied, as exemplified by the subjects of his papers published in the "Philosophical Transactions"—"On the Vibrations and Tones produced by the Contact of Bodies having Different Temperatures" (1854); "On the Physical Phenomena of Glaciers" (1855); "On some Physical Properties of Ice" (1855—1859); "On Transmission of Heat through Gaseous Bodies" (1859); a series on "Radiation," six papers (1861—1865); "On Calorescence" (1865); "On the Invisible Radiation of the Electric Light" (1865). During the year 1867, he lectured on "Sounding and Sensitive Flames."

In 1855, and again in 1861, T. was appointed to deliver the Bakerian Lecture to the Royal Society: the subjects were: "On the Nature of the Force by which Bodies are repelled from the Poles of a Magnet;" and "On the Absorption and Radiation of Heat by Gases and Vapors, and on the Physical Connection of Radiation, Absorption, and Conduction," the latter being one of the series on "Radiation" above mentioned. The publication of this series of papers marks a period in the history of scientific research, for the facts therein set forth, and the conclusions drawn from them, demonstrate the relation of aqueous vapor to radiant heat, and elucidate certain meteorological phenomena which connect themselves with some of the profoundest and most interesting questions of cosmical science.

In 1864, the Council of the Royal Society awarded to T. their Rumford medal, in recognition of his scientific researches, particularly as bearing on Light and Heat. As a lecturer on scientific subjects, T. enjoys a high reputation. His lectures at the Royal Institution and the School of Mines have been marked by fullness of knowledge and clearness of illustration. T. has experimented and written on the subject of germs, and on the neonetic transparency or cloudiness of the atmosphere.

In 1862, T. was elected a Fellow of the Royal Society. In 1858, he was appointed Professor of Natural Philosophy in the Royal Institution, where, as successor to Davy and Faraday, he sustains the reputation of the place for original scientific

research. His lectures at the School of Mines have been attended by crowds of workmen. He is LL.D. of Cambridge, and is a member of a number of the scientific societies of the continent. He was chosen President of the British Association in 1874. Besides his papers for the Royal Society, T. has written articles in the "Philosophical Magazine" and "The Fortnightly Review." His separate works comprise "The Glaciers of the Alps, being a Narrative of Excursions and Events" (1860); "Mountaineering in 1861" (1862); "Heat considered as a Mode of Motion" (2d ed., 1865); "Radiation," being the Rede Lecture, delivered at Cambridge in 1866; "Lectures on Sound" (1867); a memoir of Professor Faraday (1868); "Fragments of Science, and Hours of Exercise in the Alps" (1871); "Six Lectures on Light" (1873); and "Address delivered before the British Association in 1874, with Additions" (1874). In 1876, T. was married to a daughter of Lord Claud Hamilton.

TYNE, a river in the north of England, important from the enormously valuable mineral district through which it flows, and for the flourishing towns that line its banks, is formed by the confluence of two head-waters—the North Tyne and the South Tyne. The North Tyne rises on the Scottish border, 11 miles south-east of Hawick. It flows south across Keilder Moor, and south-east to Hexham, after traversing a district abounding in picturesque villages and gentlemen's seats. Its chief affluent is the Reed, which rises on Carter Fell, and flows south-east past Otterburn to Bellingham, where it joins the larger stream. Near Hexham, the North Tyne is joined by the South Tyne, which rises on the slopes of Cross Fell, 11 miles north of Appleby, in Westmoreland, flows north to Haltwhistle, and thence east to Hexham, through a district crowded with old castles and peel-houses. From the junction of the two head-waters, the T. flows east through the south of Northumberland, which presents charming scenery, and is studded with castles and country seats. At Blyth—about 8 miles above Newcastle—the navigation begins, and from this point, passing Newcastle (q. v.), Gateshead (q. v.), North Shields (q. v.) and South Shields (q. v.), its banks are lined with foundries, furnaces, docks, wharfs, and quays. Total length 80 miles. For the navigation of the river, see the chief towns near its mouth.

TYNEMOUTH, a small village and parish of Northumberland, takes its name from the river Tyne, on the north bank of which, and near its mouth, it stands. It is 8 miles east of Newcastle by railway, and its light-house is in lat. 55° 1' n., long. 1° 25' w. Though itself only a village, it gives name to a township containing (1871) 21,908 inhabitants. Much of this township, however, is comprised in the town of North Shields (see SHIELDS, NORTH), and counts in the population of that town. It also gives name to a parliamentary and municipal borough, containing (1871) 38,960; but including besides the village of T. the large town of North Shields, and the three villages of Chirton, Preston, and Cullercoats. The village of T. is much frequented as a watering-place by the inhabitants of Newcastle. Its sands, about a mile in length, form an excellent bathing-ground. There are many attractive buildings and institutions, as the castle and fortifications, the fine ruins of a priory and Lady Chapel, the Master Mariners' Asylum, &c. The borough of T. sends one member to the House of Commons.

TYPE (Gr. *typos*, an impression or stamp), the name given to the stamps or dies which impress the letters on the paper in Printing (q. v.). Printers, in early times, made the letters which they used, but in process of time the necessity for a division of labor created the distinct business of *type-founding*. There is evidence that, at the beginning of the 16th c., the apparatus for type-founding was much the same as up till near the middle of this century. The first step in the process is the cutting of a punch or die resembling the required letter. The punch is of hardened steel, with the figure of the letter cut, the reverse way, upon its point. On this die being finished, it is struck into a piece of copper about an inch and a quarter long, one-eighth of an inch deep, and of a width proportionate to the size of the type to be cast. This copper being so impressed with the representation of the letter, requires to be adjusted to the mould, so that the "face" or impression of the punch (in the copper) may be brought into such relation with the metal which forms the "body" or stalk of the type, that when the types are "set up" they may stand at the proper distance from each other, and be in "line" or range, and also square to the page; this work is termed "justifying," and the copper is now a "matrix." The matrix is

now fixed into a small instrument or frame, called the mould, which is composed of two parts. The external surface is of wood, the internal of steel. At the top is a shelving orifice, into which the metal is poured. The space within is of the size of the required body of the letter, and is made exceedingly true. The melted metal, being poured into this space, sinks down to the bottom into the matrix, and instantly cooling, the mould is opened, and the type is cast out by the workman. This process of casting types is executed with great celerity. Of course, every separate letter in the alphabet, every figure, point, or mark, must have its own punch and matrix. In casting types, the founder stands at a table, and has beside him a small furnace and pot with heated metal, which he lifts with a small ladle. *Type-metal* was a compound of lead and regulus of antimony, with a small proportion of tin; but in 1866, a new compound was formed by adding a large proportion of tin to the lead and antimony, which considerably increased the cost of the metal, but it doubled its durability. The antimony gives hardness and sharpness of edge to the composition, while the tin gives toughness and tenacity, and removes the brittleness which antimony causes when used in a large proportion without tin. The proper proportions of these metals are regulated by the size of the type, a greater quantity of antimony being employed for small than large letters.

Various attempts were made during the early part of this century to cast type by machinery, but the first successful machine was introduced and patented by Miller and Richard, of Edinburgh, in 1848. This machine, which requires a man to drive it, produces more than double the quantity that the hand-mould did, while the finish and regularity of the type so cast are much more perfect. Another machine was constructed and patented some years after by the same firm, with the view to apply steam for driving, which was successfully completed in 1860, and is now the most advanced and approved system of casting.

The type-casting machine consists, first, of a small melting-pot, which contains the molten metal, and is placed over a small furnace having an outer case of cast-iron. In the interior of the pot is arranged a forcing-pump and valve for admitting the metal under the piston, and also for preventing the return of the metal into the mass in the pot when the piston is depressed, and thus securing the full force exerted upon the piston being transmitted by the piston to the molten metal under it, and forcing it through a narrow channel leading from the bottom of the chamber in which the piston works to the outside of the pot, where a nipple is inserted, with a small hole through it, communicating with this narrow channel. Against this nipple, the mould in which the type is formed is pressed at the moment at which the piston descends, and so receives the molten metal that forms the type.

The second part of the machine is that which carries the mould, and to which the mould is firmly bolted. The mould is similar to the old hand-mould, but modified to suit the machine; it is much stronger; the "jets" are shorter, and the orifice by which the metal enters is smaller, so that it may be brought exactly coincident with the small hole in the nipple in front of the pot. The mould—as the old hand-mould—is made in halves; the one half being firmly bolted to an arm which, by cams and levers, is made to oscillate, and carry the mould to and from the nipple in front of, and above the pot; the other half of the mould is bolted to another arm, which, by a peculiarly formed hinge, is attached to the first arm, so that the two halves of the mould may be made to open and shut upon each other, like the lid of a snuff-box; and so both sides of the mould oscillate together to and from the nipple in the pot from which they receive the molten metal. The furnace, with the pot and machine carrying the mould, are raised upon cast-iron framing to a height convenient for a man standing to watch the working of the machine. The operation of the machine is as follows: The piston being raised in the chamber of the pump, and the chamber being supplied with metal through the valve, the mould is brought against the nipple; the valve closes, to prevent the metal being forced back into the pot; the piston descends, and forces the metal through the narrow channel into the mould; the mould then recedes from the nipple, and in receding, the two halves separate from each other, and eject the type; the mould again approaches the nipple, and in approaching, the two halves close together, and are ready for another operation.

A blast of cold air is directed upon each mould, to keep it cool.

When the type is cast from the mould, it is in a rough state; and as soon as a heap has accumulated on the caster's table, they are removed by a boy, who breaks off a superfluous tag of metal, or "jet," hanging at the end of each type. From

the breaking-off boy the types are removed to another place, where a boy rubs or smooths their sides upon a stone. Being now well smoothed, they are next removed to a table, and set up in long lines upon a "stick;" they are then dressed or finished, and after being examined by a magnifying-glass, are ready for use. Whatever be the size of the types, they are all made of a uniform height, and must be perfectly true in their angles, otherwise it would be quite impossible to lock them together. A single irregular type would derange a whole page. The height of type made in this country is 29-32ds of an inch; those made in France, Spain, and Germany are higher. All the types of one class of any founder are always uniform in size and height; and to preserve their individuality, all the letters, points, &c. belonging to one class are distinguished by one or more notches or nicks on the body of the type, which range evenly when the types are set. These nicks, as we shall immediately see, are also exceedingly useful in guiding the hand of the compositor. Types are likewise all equally grooved in the bottom, to make them stand steadily.

The earliest types used were in the style known as Gothic or Black-letter; which was afterwards superseded, except in Germany, by the Roman letter. See BLACK-LETTER. The varieties of size of types in the present day amount to forty or fifty, enlarging, by a progressive scale, from the minutest used in printing pocket-Bibles, to the largest which is seen in posting-bills on the streets. Printers have a distinct name for each size of letter, and use about sixteen sizes in different descriptions of book-work; the smallest is called *Brilliant*, the next *Diamond*, and then follow in gradation upwards, *Pearl*, *Ruby*, *Nonpareil* (the type with which this sheet is printed), *Emerald*, *Mignon*, *Brevier*, *Bourgeois*, *Long Primer*, *Small Pica*, *Pica*, *English*, *Great Primer*, and *Double Pica*. The larger sizes generally take their names thus—*Two-line Pica*, *Two-line English*, *Four. Six*, *Eight*, or *Ten-line Pica*, &c. Other nations designate many of these sizes by different names. Some of these names were given from the first maker; others from the books first printed with the particular letter. Thus, *Cicero* is the name of a type in France and Germany, with which Cicero's letters were first printed (Rome, 1467); *Pica* is from the service of the mass, termed *Pica* or *Pic*; *Primer* from *Primarius*, the book of Prayers to the Virgin; *Brevier*, from *Breviary*; *Canon*, from the *canons* of the Church, &c.

All kinds of types are sold by weight by the founders, the price varying in amount according to the size of the letter. The smallest size, *Brilliant*, cost about 10s. per pound; *Diamond*, about 8s. per pound; *Brevier*, about 1s. 6d.; *English*, 1s.; and so on in proportion for all intermediate sizes. Expensive as types thus are, their prices will not appear too high, considering the immense outlay in cutting the punches and the general manufacture. In the *Diamond* size, 2800 go to a single pound-weight of the letter f, and of the thinnest *space* about 5000.

A complete assortment of types is called a *Font*, which may be regulated to any extent. Every type-founder has a scale shewing the proportional quantity of each letter required for a font; and a peculiar scale is required for every language. For the English language, the following is a type-founder's scale for the small letters of a font of types of a particular size and weight:

a	8500	h	6400	o	8000	v	1900
b	1800	i	8000	p	1700	w	2000
c	8000	j	400	q	500	x	400
d	4400	k	800	r	6900	y	2000
e	12,000	l	4000	s	8000	z	200
f	2500	m	8000	t	9030		
g	1700	n	8000	u	8400		

It will be seen from this scale that the letter *s* is used much more frequently than any other character.

Type-founding originated in Germany along with printing; as early as 1452, P. Schöffer (see GUTENBERG) had substituted types of cast-metal for the original wooden types. The earliest and best punch-cutters were in Nürnberg, which continued for a considerable time to supply the type-founders throughout Germany with punches. Bodoni (b. 1740, d. 1813) in Italy, the Didots (q. v.) in France, and Breitkopf (b. 1719, d. 1794) in Leipzig, are the most distinguished names in the subsequent history of type-making on the continent. The art made little progress in Great Britain from the time of Caxton, and the types used were mostly imported

from Holland, until about the year 1720, when William Caslon, originally an engraver of ornamental devices, turned his attention to letter-cutting, and soon established such a reputation as not only put a stop to the importation of foreign types, but caused his own to be frequently sent to continental countries. The foundry established by Caslon in London is still in existence. Baskerville (q. v.) is the next greatest name in the history of the art in England. The types produced by Alexander Wilson of Glasgow became the foundation of the fame of the Foulis (q. v.) as printers. The type-foundry of Miller and Richard in Edinburgh has enjoyed a well-merited reputation for half a century and more.

The large letters used in posting and hand-bills were formerly manufactured chiefly in London and Sheffield, but are made now also in Edinburgh. In this kind of types, very great improvements have also been made in recent times; and the varieties are becoming yearly more numerous and ornamental in character. The letter used in printing in North America is made principally at New York; and the style of both typography and press-work in that country is rapidly improving.

Type-setting, or "Composing."—All the types used in printing-offices are sorted in cases, or shallow boxes, with divisions. There are two kinds of cases—the *upper* and *lower case*; the latter lying nearest the compositor upon the frame for their support. In the upper case are placed all the capitals, small capitals, accented letters, a few of the points, and characters used as references to notes. In the lower case lie all the small letters, figures, the remainder of the points, and spaces to place betwixt the words. In the lower, no alphabetical arrangement is preserved; each letter has a larger or smaller box allotted to it, according as it is more or less frequently required; and all those letters most in request are placed at the nearest convenient distance to the compositor. By this ingenious and irregular division of the lower case, much time is saved to the compositor, who requires no label to direct him to the spot where lies the particular letter he wants. To a stranger, nothing appears so remarkable as the rapidity with which a compositor does his work; but habit very soon leads the hand rapidly and mechanically to the letter required. When *italic* letters have to be introduced, they are taken from a separate pair of cases of the same font.

The process of composing and forming types into pages may now be adverted to. Placing the copy or manuscript before him on the upper case, and standing in front of the lower case, the compositor holds in his left hand what is termed a composing-stick. Sometimes this instrument is of wood, with a certain space cut in it of a particular width; but more commonly it is made of iron or brass, with a movable slide, which, by means of a screw, may be regulated to any width of line. In either case, the composing-stick is made perfectly true and square. One by one, the compositor lifts and puts the letters of each word and sentence, and the appropriate points, into his stick, securing each with the thumb of his left hand, and placing them side by side from left to right along the line. When he places a letter in the stick, he does not require to look whether he is placing it with the face in its proper position; his object is accomplished by looking at what is called the *nick*, which must be placed outward in his composing-stick. This is one of those beautiful, and at the same time simple, contrivances for saving labor which experience has introduced into every art, and which are as valuable for diminishing the cost of production as the more elaborate inventions of machinery. When he arrives at the end of his line, the compositor has a task to perform in which the carelessness of the workman is greatly exhibited. The first letter and the last must be at the extremities of the line: there must be no large spaces left in some instances, and crowding in others, as we see in the best manuscript. Each metal type is of a constant thickness, as far as regards that particular size of letter; though all the letters are not of the same thickness. The adjustments, therefore, to complete the line with a word, or at any rate with a syllable, must be made by varying the thickness of the spaces between the words. A good compositor's work is distinguished by uniformity of spacing; he will not allow the words to be very close together in some instances, and with a large gap between them in others, as is evident, for instance, in this sentence. In composing poetry, or similar matter, where there is always a blank space at one of the ends of the line, spacing is very easily accomplished by filling up the blank with larger spaces, or *quadrats*. But whether prose or poetry, the matter of each line must be equally adjusted and *justified*, so as to correspond in point

of compactness with the previously set lines. The process of composing is greatly facilitated by the compositor using a thin slip of brass called a *setting-rule*, which he places in the composing-stick when he begins, and which, on a line being completed, he pulls out, and places upon the front of the line so completed, in order that the types he sets may not come in contact with the types behind them, but glide smoothly into their places to the bottom of the composing-stick.

When the workman has set up as many lines as his composing-stick will conveniently hold, he lifts them out by grasping them with the fingers of each hand, and thus taking them up as if they were a solid piece of metal. He then places the mass in an elongated board, termed a *galley*, which has a ledge on one or perhaps both sides. The facility with which some compositors can lift what is called a *handful* of movable type without deranging a single letter, is very remarkable. This sort of skill can only be attained by practice; and one of the severest mortifications which the printer's apprentice has to endure, is to toll for an hour in picking up about a thousand letters, and then see the fabric destroyed by his own unskillfulness, leaving him to mourn over his heap of broken type, technically denominated *pie*.

Letter by letter, and word by word, is the composing-stick filled; and by the same progression the galley is filled by the contents of successive sticks. When the compositor has set up as many lines as fill a page, he binds them tightly round with cord, and removes them from the galley.

Sometimes, as in the case of newspaper and similar work, the *handfuls* of type are accumulated till they fill the galley, and in that form are prepared for press. After the matter is thus far prepared, it is the duty of the pressman to take an impression or *first proof* from the types, in order that the first-proof *reader* may compare with "copy," or MS.; after which it is handed to the compositor, so that he may correct the errors which are sure to have been made. Proofs are usually taken by a press kept for the purpose. After the galley matter is corrected and re-corrected by the compositor, it is divided into pages of the size wanted; and headlines or figures indicating the number of the page, being added, the pages are arranged upon a large firm table, and there securely fixed up in an iron frame or *chess*, by means of slips of wood and wedges, or *quoins*.

This process, which is called *imposing*, being completed, and the face of the types being levelled by a *planer* and mallet, the *form*, as it is called, is proved, and prepared for press. Proof-sheets being taken, they are subjected to the scrutiny of a *reader* employed in this peculiar function in the office, the author himself having previously given effect to his corrections or emendations. When the *reader* has pointed out words and letters to be altered or corrected, the compositor once more goes over the form, correcting the errors by lifting out the letters with a bodkin, and, when revised, the sheet is pronounced ready for printing. The imposing-table at which all these corrections are made is usually composed of smooth stone, or marble, or cast-iron on the top, and requires to be a substantial fabric. See TYPE-SETTING MACHINES.

TYPE, in Theology, an image or representation of some object which is called the antitype. In theological use, it is applied chiefly, although not exclusively, to those prophetic prefigurings of the persons and things of the New Dispensation which are found in the ritual, and even in the history, of the Old Testament. Under the heads HERMENEUTICS, EXEGESIS, have been explained the different senses of which the literal text of Scripture is considered susceptible. Of one of these, the "mystical," the "typical" sense forms another subdivision. The word "type" itself is used as well by the writers of the New Testament (Acts, vii. 43; Romans, v. 14; Philippians, iii. 17) as by the Jewish historians, for instance, Philo, "Opp." t. p. 103; and while St Paul and other sacred writers speak of the ancient types of things to come, St Peter completes the parallelism by describing baptism as the antitype of the ark of Noah, 1 Peter, iii. 21. Of the types of the Old Testament, many are directly pointed out as such in their very institution; many also are distinctly applied in the New Testament. There is a large class, however, which more properly fall under the mystical sense of Scripture, and which are called indirect, that is to say, "adaptive" or "applied" types. In the application and interpretation of these, many of the Fathers, and especially Augustine and Gregory the Great, are most elaborate and ingenious.

TYPES, Chemical. The idea of referring organic bodies to some simple type or representative, has attracted the attention of many chemists, amongst whom Dumas, Sterry Hunt, Laurent, and Gerhardt, especially deserve notice. As our limited space prevents us from attempting to trace out the history of the theory, we shall confine ourselves to a statement of the outline of the doctrine as laid down by Gerhardt, and now adopted in most recent books on organic chemistry. The four principal types, to which most of the chemical compounds are referred, are the following:

(1) The hydrogen or metallic type, $\begin{smallmatrix} H \\ H \end{smallmatrix}$; (2) The hydrochloric acid or chloride type, $\begin{smallmatrix} H \\ Cl \end{smallmatrix}$; (3) The water or oxide type, $\begin{smallmatrix} H \\ H \end{smallmatrix}$ O₂; and (4) The ammonia or nitride type, $\begin{smallmatrix} H \\ H \end{smallmatrix}$ N.

The reason why the equivalents of the hydrogen in the hydrogen type, and of the water in the water type, are doubled, is as follows: an accurate study of the volumetric relations of nearly all organic compounds, shews that their molecules furnish equal volumes of vapor, and that the gaseous volume occupied by each molecule will occupy 4 volumes, if oxygen represent the unit of volume. Taking the volume of oxygen, O, as 1, those of hydrogen, H, and of water, HO, are, as well known, 2. Hence, to fix the standard of comparison at 4 volumes of oxygen, we must write H₂ or $\begin{smallmatrix} H \\ H \end{smallmatrix}$, or H₂O₂, or $\begin{smallmatrix} H \\ H \end{smallmatrix}$ O₂, instead of the apparently simpler forms, H and HO. In the other cases, this modification is unnecessary, as the gaseous volumes of hydrochloric acid (HCl) and ammonia (NH₃) are in accordance with the general laws, and are equal to four standard volumes.

1. The *hydrogen type*, $\begin{smallmatrix} H \\ H \end{smallmatrix}$, includes, according to Gerhardt, the radicals of the alcohols, marsh gas, and the hydrocarbons homologous with it, the aldehyds, &c. Thus, marsh gas (or hydride of methyl), C₂H₆, is written $\begin{smallmatrix} C_2H_5 \\ H \end{smallmatrix}$, according to the type-theory, and aldehyd (hydride of acetyl), C₄H₆O₂, is written $\begin{smallmatrix} C_4H_5O_2 \\ H \end{smallmatrix}$; or both the upper and lower equivalent of hydrogen in the typical formula may be repeated. Thus, acetone or methylide of acetyl, C₆H₈O₂ = $\begin{smallmatrix} C_6H_7O_2 \\ C_2H_5 \end{smallmatrix}$. Amongst the compounds of inorganic chemistry belonging to this type, Gerhardt places the hydrides, arsenides, and antimonides of the metals.

2. The *hydrochloric acid type*, $\begin{smallmatrix} H \\ Cl \end{smallmatrix}$, is removed by many chemists from the primary or principal types, and is regarded as a derived type from the preceding one, one equivalent of H being here replaced by one of chlorine. It includes the chlorides, fluorides, iodides, bromines, cyanides, the ethers of the hydracids, &c. As examples, we may take chloride of benzoyl, C₁₄H₉O₂Cl = $\begin{smallmatrix} C_{14}H_8O_2 \\ Cl \end{smallmatrix}$, hydrochloric ether C₄H₅Cl = $\begin{smallmatrix} C_4H_4 \\ Cl \end{smallmatrix}$, and iodide of ethyl, C₄H₉I = $\begin{smallmatrix} C_4H_8 \\ I \end{smallmatrix}$.

3. The *water type*, $\begin{smallmatrix} H \\ H \end{smallmatrix}$ O₂, includes the oxides (in which term are embraced acids, bases, and salts), the sulphides, the alcohols, the simple and compound ethers, the monobasic organic acids, &c. The following are a few examples: methyl alcohol or wood-spirit, C₂H₄O₂ = $\begin{smallmatrix} C_2H_3 \\ H \end{smallmatrix}$ O₂; common alcohol, C₄H₈O₂ = $\begin{smallmatrix} C_4H_7 \\ H \end{smallmatrix}$ O₂; acetic acid, C₄H₄O₄ = $\begin{smallmatrix} C_4H_3O_2 \\ H \end{smallmatrix}$ O₂; acetate of potash, KO, C₄H₃O₃ = $\begin{smallmatrix} C_4H_2O_2 \\ K \end{smallmatrix}$ O₂; acetic ether, C₄H₈O, C₄H₇O₂ = $\begin{smallmatrix} C_4H_6O_2 \\ C_4H_5 \end{smallmatrix}$ O₂; common ether (C₄H₈O)₂ = $\begin{smallmatrix} C_4H_7 \\ C_4H_5 \end{smallmatrix}$ O₂, &c.

4. The *ammonia type*, $\begin{smallmatrix} H \\ H \end{smallmatrix}$ N, includes the nitrides and phosphides, the compound

Type
Typhon

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ammonias, and the amides; as, for example, ethylamine or ethylla, C_4H_7N — $\left. \begin{matrix} C_4H_5 \\ H \\ H \end{matrix} \right\} N$; trimethylamine or trimethylia, C_3H_9N = $\left. \begin{matrix} C_3H_7 \\ C_2H_5 \\ C_2H_5 \end{matrix} \right\} N$; benzamide, $C_{14}H_{17}NO_2$ — $\left. \begin{matrix} C_{14}H_{15}O_2 \\ H \\ H \end{matrix} \right\} N$, &c.

Besides these three or four principal types, there are *derived types*, *multiple types*, and *mixed types*; and under one or other of these types, primary and derived, multiple and mixed, all organic compounds can be arranged; and the theory of types leads to the general conclusion, that all organic compounds, or, more strictly speaking, their molecules, may be regarded as molecules of hydrogen, water, ammonia, hydrosulphuric acid, &c., in which the hydrogen is entirely, or in part, replaced by organic radicle. — For further information on this subject, the reader is referred to Odling's "Lectures on Animal Chemistry," 1866, and to the second volume of Gorup Besauze, "Lehrbuch der Chemie," pp. 24—48. The chapter "On Types," from this volume, has been reprinted separately in the form of a pamphlet.

TYPE-SETTING MACHINES. The first type-composing machine on the records of the English Patent Office appears to be that of Mr W. Church, and the specification of his patent is dated March 1822. This, after a lapse of twenty years, was followed by a number of others, scarcely a year passing with out one or more being made the subject of a patent. Moreover, some of them, among others those of Young and Delcambre, were for a long time before the public. For at least half a century, therefore, the construction of a useful type-setting machine has been a problem which a number of ingenious men have tried to solve, but it is only within the last year or two that there has been anything more than the mere appearance of success. If the reader will look carefully at a page of printed matter, he will notice that the spaces between the words are not equal, and he will easily understand that to reduce this inequality to a minimum, requires skill and experience if the work is to go on swiftly. It is in the doing of this, which is called "justifying," where a machine fails, because another operator must afterward space the machine setting into lines of equal length. It is comparatively easy to construct a machine which will, by some mechanical arrangement, drop any required letter from a series of files or reservoirs of types, through a channel which conveys to a composing-stick—that is, which will set up type, in any required order, but with *exactly equal spaces* between the words; but the difficulty of justifying has not yet been got over. Still, as that operation can be performed by girls at comparatively little cost, there is a decided advantage in favor of the machine.

In the early composing-machine by Church, "the types are arranged in files in a case at the top, each file being directly over a slit in a horizontal frame. One of a number of jacks protrudes through each of these slits, each jack being connected with a key in a manner somewhat similar to the jacks and keys of a harpsichord." On the depressing of any particular key, the undermost type of the file is pushed into a race, from which it passes to a composing-stick. It is surprising how closely this description conveys to us the leading idea in most of the type-composing machines invented since 1822. Hattersley's machine, for example, which was patented in 1857, has somewhat analogous movements, but the keys are arranged more like those of a *concertina*, and the details are different. This machine, which occupies a space of about 2 feet by 3, has a horizontal top stage on which is placed a partitioned tray, containing the rows of types running from back to front, each row being of course all the same letter. Descending vertically along the front of this tray is a series of as many wires with pistons as there are rows of types, and these pistons are depressed by the keys acting by bell-cranks, and then returned to their first position by means of india-rubber bands or springs. A propeller kept in a state of tension by an india-rubber string is placed in the rear of each row of types, and draws them forward to the piston. When the girl working the machine presses down, say an e key, it depresses the e piston, which pulls down with it an e type, and drops it into a tube or channel which conveys it to what represents the composing-stick, and so on with every other letter, figure, comma, or "space." The series of channels converge to a focus or common outlet, through which every type in succession passes to its proper place. Machines on Hattersley's principle, with the

details much improved by Mr Fraser of Edinburgh, are at present in use by a large printing firm there. With one of these machines a girl can compose from "copy" at the rate of from 10,000 to 12,000 types per hour, but this rate can hardly be maintained continuously, the strain of such rapid setting being too great for the operator. The types are set in long lines, and require afterwards to be "justified." This is done by another girl, who, with the aid of a slip of brass of the desired length of line, forms the matter into pages, spacing out each line as she proceeds.

The want of an efficient distributing machine has hitherto been the great drawback to the adoption of compositors, but Mr Fraser has met this difficulty by constructing a distributor which bids fair to supply the want. It separates the different letters by a series of switches acted upon by keys similar to those of the composing-machine. On the depression of a key, the corresponding switch is opened, and the type guided to its proper compartment in the composing-machine reservoir. Type setting and distributing machines like the above in their plan of working, have been in operation for several years in the "Times" office, one of which was exhibited at South Kensington in 1872. Another composing-machine, by Mr Mackie of Warrington, deserves notice for the ingenuity shewn in its construction. It is much more elaborate than any of those above referred to. The first operation is to perforate slips of stiff paper, which is done by a separate machine. These slips, when perforated, represent the words to be composed, and are then passed to the composing-machine proper. In it the types are placed by hand in a series of boxes above the circumference of a large wheel, which is made to revolve, and at each revolution a certain part, acting in concert with the previously perforated paper, comes in contact with mechanism which releases the desired types at the proper time, and carries them forward to a point, where they are pushed off into lines in the composing-stick.

TYPHA. a genus of plants, belonging to the natural order *Typhaceæ* of some botanists, which, according to others, is a sub-order of *Araceæ*. The *Typhaceæ* all inhabit marshes or ditches. They have nodeless stems, unisexual flowers arranged on a spadix without a spathe, the spadix of the male flowers being situated at the summit of the stem, above that of the female flowers, the perianth consisting of scales or lax hairs, the anthers on long filaments, the fruit dry, consisting of the seed with adherent pericarp. They are found in very different climates, and scattered over the world. Two species of *T.* are found in Britain, *T. latifolia* and *T. angustifolia*, and are popularly known as CAT'S-TAIL or REEDMACE. *T. latifolia* is the most common. It is sometimes called Bulrush. It grows to the height of five or six feet. The root-stocks are astringent and diuretic, and abound in starch. The young shoots both of this and *T. angustifolia*, a smaller plant, are much eaten by the Cossacks of the Don; and are sometimes used in England under the name of *Cossack Asparagus*. The pollen of *T.* is inflammable, like that of *Lycopodium*, and is used as a substitute for it. *T. angustifolia* and *T. elephantina* are employed in India for making mats and baskets.

TYPH-FEVER is a term which is now coming into use to designate continued low fever. The best-marked varieties of this affection are known as typhus and typhoid fevers, which in typical cases are easily distinguished from one another, but not unfrequently so merge into one another that it is difficult to decide whether the disease should be classed as typhus or typhoid fever; and hence the general term typh-fever is a very convenient one in doubtful cases. All the typh-fevers belong nomenclologically to the miasmatic order of zymotic diseases.

TY'PHON, in Egyptian Mythology, was the Greek name of a son of Seb (Kronos) and Nut (Rhea). The latter gave birth to five children on the last five days of the year; first, Osiris and Harooris, then *T.*, and lastly Isis and Nephthys. The Egyptian name of *T.* was Set, also Suti and Setech, and in the earliest times he was a highly venerated god. He often appears on the monuments in the form of a beaver, the cunning crocodile, the dreaded hippopotamus, or the obstinate ass, and with yellow hair and long blunted ears. From him the kings of the 19th dynasty, Seti (Setihs, Sethosis, changed by Herodotus into Sesostri), derive their name. The city of Ombos was a special seat of his worship. In later times, however, either about the close of the 21st dynasty or afterwards, his worship was abandoned, and his figure and name were obliterated from many of the monuments. The cause of this

Typhoons
Typhus

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curious religious revolution is unknown, but at any rate, T. came to be regarded as a god hostile to the Egyptians, and was gradually developed into a personification of the principle of Evil—in short, the Egyptian devil, the opponent of holy doctrine, and adversary of Osiris—the god of the waste howling wilderness, of the salt lakes, of drought, and of scorching heat.

The connection between the Egyptian *Set* and the Greek T. is not very easy to trace, but it undoubtedly existed. According to Homer, T. (called also *Typhæon*) was a huge giant, chained under the earth in the country of the *Arimol*, and lashed by the lightnings of Zeus. Hesiod makes him a son of *Typhæus* and a hurricane, and, by the snake-goddess, *Echidna*, the father of the *Chimæra*, the many-headed dog *Orthus*, the hundred-headed dragon that guarded the apples of the *Hesperides*, the Colchian Dragon, the *Sphinx*, *Cerberus*, *Scylla*, *Gorgon*, the *Lernaean Hydra*, the *Eagle* that consumed the liver of *Prometheus*, and the *Nemean Lion*. *Typhæus*, again, was the youngest son of *Tartarus* (Hell) and *Gæa* (Earth), or, as others say, of *Hera* (Juno) alone. At a later period, the father and son coalesced into one person. *Pindar* describes T. as a monster with a hundred dragon-heads, fiery eyes, a black tongue, and a terrible voice. He sought to wrest the sovereignty of the world from Zeus, but after a fearful struggle, he was subdued by a thunderbolt from Olympus, and hurled into *Tartarus*, or buried under *Ætna*. The later poets modify the older myth with fabulous additions of their own. They connect T. with Egypt—a proof, perhaps, that he had come to be identified with the Egyptian *Set*. According to *Ovid* and others, all the gods fled before him into Egypt, and through fear, changed themselves into animals, excepting Zeus and *Athena*. After an appalling struggle, in the course of which Zeus was once hamstrung, and carried off by the daring monster, T. was vanquished, but not before he had hurled all Mount *Hæmus* against his adversary, in a paroxysm of supernatural rage. It is very possible that the fierce physical opposition of T. (especially when the monster came to be identified with *Set*, the Egyptian Devil) may have had (along with other causes) a material influence in determining that popular conception of "Satan" which reigned both in patristic and medieval times, and of which *Milton* has so largely availed himself in his "Paradise Lost."

TYPHOONS (Chinese *Tai-fun*, i. e. "hot wind;" the word, it need scarcely be said, has no connection with the Typhon of mythology) are violent storms which blow on the coast of Tonquin and China as far north as *Ningpo* and the south-east coasts of Japan. *Varenius*, in his "*Geographia Naturalis*," describes them as "storms which rage with such intensity and fury that those who have never seen them can form no conception of them; you would say that heaven and earth wished to return to their original chaos." They occur from May to November; but it is during the months of July, August, and September that they are most frequent. They resemble the storms of Western Europe (see **STORMS**) in their general characteristics, with this difference, that the main features are more strongly marked. There is a depression of the barometer, over a space more or less circular in form, accompanying the typhoon, but it is generally more contracted in area, and deeper and more abrupt than in European storms. It is not uncommon for the barometer, at the centre of the depression, to read 28.3 inches, and on rarer occasions to fall even as low as 27 inches; and the changes of pressure are very rapid, frequently .2 or .3 inch in an hour. It is this enormous difference of atmospheric pressure between neighboring places, and the consequent rapidity of the fluctuation, which give to these storms their terribly destructive energy—the law regulating the strength of the wind being, that it is proportioned to the difference of pressure between the place from which it comes and the place toward which it blows. The low pressure in the centre is confined to a very limited space, and since all round this space the pressure is greater, it follows that the level of the sea there will be higher. Hence, a high wave is frequently found to accompany these storms, advancing inland, carrying with it ruin and dismay, and not unfrequently bearing ships far over the level fields, where they are left stranded a considerable distance from the sea.

Typhoons have their origin in the ocean to the east of China, especially about *Formosa*, *Luzon*, and the islands immediately to the south. They thence proceed, in four cases out of five, east-north-east toward west-south-west, more rarely from east-south-east to west-north-west, and scarcely ever from north to south, or from

south to north; in other words, their course is generally along the coast of China. The body of the storm advances at the rate of 12 miles an hour and upwards, within which the winds blow often from 80 to 100 miles an hour, whirling round the centre of atmospheric depression in a direction contrary to the motion of the hands of a watch, as all storms in the northern hemisphere do. They thus rotate in the direction south, east, north, west; and travel along the coast, so that the coast feels the northern side of the storm, while at a distance from the coast the southern side is alone experienced. The southwest Monsoons (q. v.) prevail in summer over Southern Asia, to the eastward of which are the north-east trade-winds. See WINDS. Here, then, are two great aerial currents flowing contiguously, *but in opposite directions*, each highly charged with moisture, especially the south-west current, which they have taken up from the oceans they have traversed. It is highly probable that the typhoons take their origin from these opposing currents, as whirlpools do at the meeting of two sea-currents; and their intensity is aggravated by the large quantity of heat disengaged in the condensation of the vapor of the atmosphere into the deluges of rain which fall during the storm—10 and 12 inches of rain frequently falling in one day. Much yet remains to be done towards the examination and explanation of this remarkable class of storms, the first and essential step being the establishing of meteorological stations on the Chinese coast, in Japan, in Formosa, and in Luzon.

TYPHUS AND TYPHOID FEVERS have so much in common, that, to avoid repetition, we shall discuss them in one article. Until comparatively few years ago, it was generally believed that no definite distinctions could be drawn between the various forms of continued low fever met with in this country. In 1840, Dr A. P. Stewart, lately one of the physicians to the Middlesex Hospital, pointed out the differences which are now almost universally recognised between typhus and typhoid fevers; but his views received little attention till 1848—1850, when Dr Jenner,* Physician to her Majesty, published two papers on "The Identity or Non-identity of Typhus and Typhoid Fevers," and on "Diseases commonly confounded under the term Continued Fevers." In these memoirs, Dr Jenner shews, by evidence which must be satisfactory to every unbiassed mind, that typhus and typhoid fevers differ, as Dr Watson observes, "notably and constantly in their symptoms and course, in their duration, in their comparative fatality, in the superficial markings which respectively belong to them, and which warrant our classing them amongst the exanthemata, in the internal organic changes with which they are severally attended, and (what is the most important and the most conclusive) in their exciting cause."—"Lectures on the Principles and Practice of Medicine," 4th ed., 1861, vol. ii. p. 796. In addition to typhus and typhoid, there is a third well-marked variety of continued fever, known as *Relapsing Fever*, which has been considered in a special article.

Typhus Fever sometimes commences to shew itself by certain premonitory symptoms, due to the depressing action of the poison—which, as will presently be seen, is the cause of the disease—upon the nervous system before it begins to affect the circulation. The patient, in these cases, is listless, unwilling to make any bodily or mental exertion, loses appetite, feels wandering pains over the body, is drowsy during the day, and restless at night. More commonly, however, the disease begins suddenly, a shivering fit being the first symptom. Severe headache, especially across the forehead, is another common early symptom. The muscular power rapidly becomes enfeebled, and the patient very soon feels compelled to take to his bed. As in typical cases of the disease, there are three sets of symptoms, each of which occupies about a week, it is convenient to divide the description of continued (or typh) fever into that of three weekly stages. In the first week, in addition to the symptoms already noticed, the heat of the skin becomes increased, and the pulse, which at first is hard, becomes soft and weak, and more frequent than in health, often now rising to 120, and in severe cases reaching 180 or 140 beats in a minute. According to Dr Jenner, the pulse in uncomplicated *typhus* gradually rises to a maximum, preserves that rate for a variable time, and then slowly falls; while in *typhoid* it rises and falls irregularly. There is considerable thirst; the tongue

* Now Sir W. Jenner, Bart.

becomes clammy and dry, and its centre is covered with a white fur, which is often mesially divided by a straight brown streak, which is the first step to the blackness of that organ which afterwards ensues. The intelligence is blunted; but on being sharply spoken to, the patient still gives rational answers. As the week advances, the strength is so reduced, that he lies on his back, and is unable to turn about in bed without assistance. In the second week, the pulse becomes more frequent, weaker, and more compressible, and the tongue grows drier and browner. The teeth and lips are invested with dark sordes, consisting of morbid epithelium that had been shed; and the weakness is now so extreme, that the patient sinks down in his bed. His voice becomes very feeble, and in bad cases he cannot swallow, nor can he put out his tongue. The two most remarkable symptoms of the second week are the delirium which seems to replace the headache, and about the ninth day ensues, and the appearance of the characteristic eruption. The delirium usually appears on the patient's awakening from sleep. He is inattentive to all that goes on around him, and usually lies still, muttering disjointed sentences, like a man talking in his dreams. Sometimes, however, he is more actively delirious, talking loudly, and trying to leave his bed. He may sometimes be roused by a strange voice, but soon relapses into his previous state. The senses are in a disturbed condition, the patient being commonly deaf, and, in advanced cases, often suffering from *Muscae Volitantes* (q. v.), which gives rise to attempts to grasp these visionary objects, or to pick them from the bedclothes. This symptom, which is known in medical language under the name of *Floccitatio*, is almost certainly indicative of a fatal result. The characteristic eruption, which Dr Jenner calls the *mulberry rash*, may shew itself as early as the fifth day, but most commonly appears at the beginning of the second week, and sometimes a little later. The characters of the rash vary with its age. It consists of very slightly elevated spots of a dark-pink color. Each spot is flattened on its surface, irregular in outline, with no well-defined margin, but fades insensibly into the line of the surrounding skin, disappears completely on pressure, and varies in size from a point to three or four lines in diameter. In two or three days, these spots undergo a marked change. They no longer remain elevated above the surrounding cuticle; their hue becomes darker and more clung than at first, and they now only fade on pressure, instead of completely disappearing. From this state they commonly grow paler, pass into faintly marked reddish-brown stains, and finally disappear. The spots composing this mulberry rash are generally very numerous, close together, and occasionally almost covering the skin. Sometimes, however, they are very few in number, situated at some distance from one another, and not to be distinguished at first from the *rose-spots*, which, as will be presently seen, occur in typhoid fever. The mulberry rash is usually situated on the trunk and extremities, but is occasionally limited to the trunk, and in rare cases is seen on the face. No fresh spots appear after the third day of the eruption, and the rash subsides between the fourteenth and twenty-first days. The mulberry rash, though characteristic of typhus when it occurs, is not an essential symptom of the disease. Dr Jenner states, that in patients less than 15 years old, in whom the mortality is not more than 2 or 3 per cent., it is mostly either absent, or pale in hue and scanty in quantity; while in persons upwards of 50 years of age, in whom the mortality is about 56 per cent., the rash is always present, and usually dark and abundant. Hence, as in the case of small-pox, the degrees of development of the eruption may be taken as a direct measure of the intensity of the disease. It is in the course of this second week that death is most apt to occur. Amongst 25 fatal cases noted by Jenner, nine deaths only occurred after the 15th day, and not one after the 20th. If the case is going to terminate fatally, symptoms commonly and expressively termed *putrid*, set in; a peculiar fetor is exhaled from the breath and the surface of the body; the tongue is dry, black, and fissured; the teeth are covered with dark sordes, and sloughing bed-sores occur. The prostration increases to the last degree, and *subcutis tendinum*, or involuntary twitchings of the muscles of the face and arms, make their appearance. In some cases, the ordinary stupor is replaced a day or two before death by the condition known as *coma vigil*. In this condition the patient never sleeps, but lies on his back, with the eyelids widely separated, the eyes staring and fixed in vacuity, the mouth partially open, and the face pale and devoid of expression. He is totally incapable of being roused to give a sign of consciousness, the pulse and breathing are

hardly perceptible, and the skin is cool. The occurrence of death is only marked by the eye losing its slight lustre, and the chest ceasing its slow and feeble movements. During the third week, the symptoms gradually abate in those cases which are going to end in recovery. The patient often falls into a profound, quiet, and prolonged sleep between the 14th and 17th day, from which he awakes with a decided general improvement. The complexion is clearer, the delirium has disappeared, the pulse has fallen, and the tongue begins to shew signs of moisture at the edges. In a few days, the tongue gradually becomes clean, the appetite becomes ravenous, and from that time the patient rapidly gains strength. In many cases, the amendment is so gradual, that it is impossible to say when it begins; and occasionally the favorable crisis is preceded by a temporary aggravation of the symptoms. A profuse sweat sometimes accompanies the favorable change. In the cases that terminate fatally, there is no rallying from the symptoms described as occurring in the second week.

The fact that the difference between typhus and typhoid fevers was first recognized only a few years ago, affords sufficient evidence that the symptoms of these diseases must be very similar. In describing *Typhoid Fever* it will consequently be sufficient if we indicate the leading points in which it differs from typhus. Amongst the earlier symptoms (although they are sometimes postponed to the end of the first week), the most characteristic are abdominal pains and diarrhoea. These are due to an ulcerated condition of the intestines, which will be presently noticed. The diarrhoea is either spontaneous, or confines after the operation of a purgative. The stools are loose and frequent; and either of a dark color and foetid, or of a yellow pea-soup-like appearance. The abdomen is found on examination to be unnaturally hard and resisting, tympanitic, and sometimes much distended; its shape, as Dr Jenner was the first to remark, "is invariably the same, and somewhat peculiar. Its convexity is from side to side, and not from above downwards. The patient is never pot-bellied, but tub-shaped; the cause probably being that the flatus occupies the colon, ascending, descending, and transverse. Pressure over the region of the cæcum frequently excites uneasiness, and usually gives rise to a peculiar gurgling movement, which is both audible and palpable, and doubtless arises from the intermixture of liquid and gaseous matters in the bowels. This gurgling is a still more common symptom at a more advanced stage of the disease, and is of the greater importance since it is rarely met with in typhus or any other disorder. An eruption usually appears at from the 8th to the 15th day of the disease. The typhoid rash is very different from that occurring in typhus; it consists of slightly elevated papule or pimples, with their heads rounded, and their bases gradually passing into the level of the surrounding cuticle. These papule are circular, and of a bright rose color, which fades insensibly into the hue of the surrounding skin. Throughout their whole course, they disappear completely on pressure, and reappear when the pressure is removed. Each papula lasts three or four days, and fresh ones make their appearance every day or two after their first eruption. The number present at a time is usually from six to twenty, but the limits may range from 1 to more than 100. Their average size is a line in diameter, and they chiefly occur on the abdomen, chest, and back. As a general rule, no fresh spots occur after the 30th day. The diarrhoea, to which reference has already been made, continues with the progress of the disease, the patient often having from three to six evacuations daily, and often unconsciously passing them in bed. This persistence of the diarrhoea is one of the results of ulceration of the bowels. Another result of this ulceration is the occurrence of hæmorrhage from the bowels, which is one of the most alarming of the symptoms of typhoid fever. It occurs most frequently during the third and fourth weeks, and varies from a mere stain to a large amount. Sometimes the blood thus poured out by the ulceration of the mesenteric veins is retained in the bowel, and is only discovered after death; the clots being unable to pass through the valve of the cæcum. This hæmorrhage is always an extremely bad symptom, and may either cause immediate death by fainting, or may so weaken the patient as to cause him to succumb to the disease.

With regard to the duration of the two diseases, Dr Jenner found that the average duration of fatal cases of typhoid was 22 days, and of typhus 14 days; the former disease may terminate favorably during the fourth week, and the latter from the 13th to the 17th day.

In cases of recovery from typhoid, a remarkable fatuity remains for a consider-

able time; a childishness of mind often remaining for more than a month after apparent restoration to health. "The patient," says Dr Aiken, "generally wakes up, as it were, from the fever, a complete imbecile. The whole man is changed. He seems to have renewed his youth. Childhood and infancy return, and the greatest care is necessary to prevent untoward events. No man can be considered as fit for work or for general military service for three or four months after an attack of severe typhoid fever."—*The Science and Practice of Medicine*, 3d ed., vol. i. p. 382.

Typhoid fever is essentially a disease of childhood and adolescence, the average age at which it occurs being $21\frac{1}{4}$ years, and it being very rarely that a person aged more than 50 is attacked; while typhus attacks persons of all ages, from early infancy to extreme old age.

The appearances presented on the examination of the body after death are very different in these diseases. While in *typhus* the most common morbid appearances are a fluid condition of the blood; hyperæmia of the cerebral membranes, and increase of inter-cranial fluid; bronchial catarrh and pulmonary congestion, especially at the posterior part of the lungs, which are more or less collapsed; softening of the heart, liver, and spleen, and enlargement of the kidneys: in *typhoid*, there is one constant and characteristic lesion, viz., a morbid condition of the agminated glands (or glands of Peyer) and solitary glands of the small intestine, and especially of the former. These morbid changes may be briefly summed up as follows: thickening, redness, tumefaction, and finally ulceration or sloughing of the glands, the ulceration always occurring in the lower third of the small intestine. On the assumption that the natural office of Peyer's glands is, as Dr Carpenter suggests, to separate noxious matters from the blood, and to discharge them into the intestinal canal, Dr C. J. B. Williams suggests that the ulceration so constantly met with in typhoid fever may result from the continued operation of the poison of that disease, thus escaping. When these changes proceed as far as ulceration, the case is one of extreme danger, although death does not necessarily ensue, because the scars left by healed ulcers are often seen when patients, who have had typhoid fever, have subsequently died from some other disease. The existence of these ulcers is, however, likely to prolong the illness after the fever itself has ended; to protract convalescence, and to hinder recovery; and to endanger life, even in cases of apparent convalescence, by causing hæmorrhage or perforation of the bowel. This perforation, which gives rise to intense peritonitis, occurs in about one in five fatal cases, and generally takes place through the ileum near the valve.

We now proceed to notice the origin and mode of propagation of these two diseases, beginning with *typhus*. There is undoubted evidence that all the forms of continued fever are contagious, and it may now be regarded as an established fact, from the investigations of Dr Jenner, that one species of fever cannot generate another, but that each is produced solely by its like; that typhus, for example, always propagates typhus, and never any other form of fever, as typhoid or relapsing fever. Some persons may, by some peculiarity of constitution, be able to resist the action of the poison, while others are peculiarly susceptible to it. An attack of fever generally exerts a certain amount of protective power against another attack of the same kind of fever; and *habit* has a good deal of power in fortifying the system against contagion, just as confirmed drunkards or opium-eaters can with impunity swallow doses of their respective poisons which would prove highly dangerous to a novice. "Upon this principle," says Dr Watson, "has been explained the comparative immunity from contagious disease, under like circumstances of exposure, of medical practitioners and nurses; of the keepers of filthy lodging-houses, while the new-coming inmates suffer; and even of prisoners, who, without having had the disease themselves, may nevertheless carry forth and communicate the infection, as is said to have happened at the celebrated 'black assizes' at Oxford, and again at the Old Bailey in the year 1750."—*Lecture on the Principles and Practice of Physic*, 4th ed., vol. II. p. 829. Whether typhus can be degenerated *de novo* by great over-crowding and vitiation of air, by the organic impurities emanating from the respiratory and other functions, is still a disputed question. The conditions essential to its propagation are (1) over-crowding combined with deficient ventilation; (2) personal filth, and clothes saturated with cutaneous exhalations; and (3) an impaired condition of the system, such as may result from insufficient food, scurvy,

and any other debilitating causes. The patient is most dangerous as a focus of infection after the end of the first week to the period of convalescence, the peculiar odor from the skin and lungs being then the strongest. If the poison be very concentrated, the disease may be caught by exposure to it for only a few minutes. Frequently, the infected person is conscious when the poison is taken in. Dr Banks of Dublin, in an excellent lecture which he delivered on 24th April 1866, in the theatre of the Richmond Hospital, "On the Origin and Classification of Fevers," states that this happened in his own case, while examining the chest of a person laboring under disease. "The patient," he observes, "was seized with cough, and I was so placed that I must have inhaled his breath. The odor was peculiar and intolerably offensive. I was certain that I had imbibed the poison; and after a latent period of three days, I exhibited the usual train of symptoms which usher in typhus of the severest form." The most common latent period is nine days.

From the investigations of various physicians, amongst whom Dr William Budd deserves especial notice, it appears that the living human body is the soil in which the specific poison of typhoid fever breeds and multiplies. The origin of the disease is unknown, but the poison is communicated or contained in the diarrhoeal discharges which issue from the diseased intestine. These discharges, as they dry up, preserve the germs of the disease; and if, through atmospheric or other agencies, these germs enter the living body, they communicate the disease, and diarrhoea soon commences. As the evacuations contain the specific virus of typhoid fever, the disease may be propagated amongst healthy persons (1) by percolation through the soil into the wells which supply drinking-water; (2) or by issuing, through defects in the sewers, into the air which is inhaled; or (3) by exhalation through the apertures of small ill-trapped water-closets or privies, which are at once the receptacles of the discharges from the sick, and the daily resort of the healthy. The atmosphere thus infected with the poison is far more dangerous than that immediately surrounding a fever-patient.

For a knowledge of the means of checking the spread of typhoid fever, society is deeply indebted to Dr Budd's researches; and provided these means are thoroughly and efficiently carried out, it is believed by many of the most eminent physicians, that the recurrence of this disease might be entirely prevented. In order to judge of the extent of the infection to be destroyed, there are two points to be considered—viz., *first*, the amount and duration of the intestinal discharge in each case; and *secondly*, the number of cases actually occurring. With regard to the first point, the diarrhoea lasts on an average fifteen days. With regard to the second point, the Reports of the Registrar-general shew that at least 100,000 to 150,000 cases of typhoid fever occur annually in England alone; or, in Dr Budd's emphatic words, "every year in England, more than 100,000 human intestines, diseased in the way already described, continue each, for the space of a fortnight or thereabouts, to discharge upon the ground floods of liquid charged with matters on which the specific poison of a communicable disease has set its most specific mark." He suggests the following details of procedure, which should be invariably attended to as soon as this disease appears: 1. All discharges from the fever-patient should be received, on their issue from the body, into vessels containing a concentrated solution of chloride of zinc. 2. Two ounces of a caustic solution of chloride of zinc should be put in the night stool on each occasion before it is used by the fever-patient. 3. All tainted bed or body linen should immediately on its removal be placed in water strongly impregnated with the same agent. 4. The water-closet should be flooded several times a day with a strong solution of chloride of zinc; and some chloride of lime should also be placed there, to serve as a source of chlorine in the gaseous form. 5. So long as fever lasts, the water-closet should be used exclusively as a receptacle for the discharges from the sick. For further details as to various precautions to be taken with a view of checking the spread of this and other epidemic diseases, the reader is referred to Mr. Simon's "General Memorandum," published (in 1860) in his "Third Report on the Public Health in England."

Although typhoid is contagious, Dr Jenner holds that it is "infinitely less so than typhus." Hence in typhus a large room should, if possible, be selected for the patient, and the air should be kept fresh by having a window or a door, or both, open. Curtains, carpets, and all superfluous furniture should be removed, and the body of

the patient should be kept as clean as possible by ablution, and his sheets and night-shirt frequently changed; the latter being at once plunged into water containing chloride of zinc. As the susceptibility to the disease diminishes with the advance of life, middle-aged attendants should be selected; and all who approach the sick-bed should avoid as far as possible inhaling the patient's breath or the emanations from his skin. Friends occasionally visiting the patient should do so after a meal and a glass of wine or ale. When typhus patients are received into the general wards of a hospital, they should be scantily distributed amongst the general patients. It is still an open point whether such a distribution or a localisation of all the fever-cases into a special fever-ward or fever-hospital is the most advisable.

From a most careful critical study of the history of fever generally, including chemical and microscopical examination of the excretions, Dr Parkes arrives at the conclusion, that the *general treatment of fever*, including typhus and typhoid fevers, may be summed up "as being a combination of measures to *reduce excessive heat, to insure proper excretion, and to act on the semi-paralysed nerves.*" The special indications for the treatment of *typhus* are: 1. To neutralise the poison, and to correct the morbid state of the blood. Hydrochloric acid is strongly recommended for this purpose; it may be given to the extent of a fluid ounce of the dilute acid daily, mixed with a quart of barley-water sweetened with syrup of ginger, and flavored with lemon-peel. 2. To eliminate the poison and the products of the destructive metamorphosis of tissue. For this purpose, alkaline salts may be prescribed to act on the kidneys and skin, and purgatives are often useful. 3. To reduce the temperature. 4. To sustain the vital powers, and to obviate the tendency to death: nourishment in the form of milk and water, coffee, broth, beef-tea, &c., must be administered at least once in every three or four hours, after the fourth day of fever, and alcoholic stimulants are usually serviceable about the seventh or eighth day. Great discrimination is required in prescribing them, and we are mainly indebted to the Dub in school—to Graves and Stokes—for pointing out the importance of the cardiac and radial pulses as guides for the use of alcohol in fevers. When the cardiac impulse becomes weak, and when the first sound of the heart is impaired or absent, stimulants should be freely given; and an irregular, intermitting, abnormally slow, or imperceptible pulse affords a similar indication. 5. To relieve the distressing symptoms, such as the headache, sleeplessness, and delirium; and 6. To avert and subdue local complications.

In *typhoid fever*, the chief indications of treatment are (1) to reduce the temperature, and subdue any vascular excitement that is present in excess; (2) to restrain excessive diarrhoea, for which purpose milk and lime-water in equal parts may be taken as a drink. The discharge ought not to be altogether checked, and Professor Gairdner prefers giving saline laxatives to astringents, and at the same time recommends that the lower bowel should be unloaded by warm-water injections, to which a little asafetida or aniseed is added. In cases in which it is doubtful whether to check or encourage diarrhoea, the physician will generally be on the safer side if he discourages the action of the bowels. (3) To stimulate the nervous system by proper food, and possibly by stimulants; (4) to maintain the free action of the kidneys, which is best effected by the administration of small doses of the alkaline carbonates, or of cream of tartar; (5) to influence the elimination of morbid matter from the affected intestinal glands. For this purpose, 1 or 2 grains of calomel should be given twice a day till about the tenth day, but not later. Special symptoms, such as great inflation of the abdomen (known as meteorism), hæmorrhage from the intestines, &c., must be treated by the ordinary rules. Probably the best single remedy for this form of hæmorrhage is oil of turpentine in doses of from 5 to 20 drops every hour or two. It is best administered in the form of an emulsion with gum-arabic, white sugar, and water. The diet is a subject of the utmost importance from the beginning of the disease till complete recovery ensues. From the various forms of farinaceous food, such as arrow-root, rice, sago, tapioca, bread, &c., from eggs beaten into custard, and milk with or without lime-water (or, preferably, effervescing Carrara water), an abundant, bland, and nourishing dietary can be selected. All animal food, excepting eggs and milk, must be rigidly prohibited. Even beef-tea and mild broths have often been found to exert a special irritant action on the overcharged glands of the ileum. During the period of convalescence, no meat should be allowed till at least a week has elapsed after all the febrile symp-

toms have vanished, and the only admissible means of opening the bowels are by castor oil or simple enemata.

Both typhus and typhoid fever have been described under various names. Typhus has been popularly known as the jail fever, hospital fever, putrid fever, brain fever, billious fever, spotted fever, camp fever, &c.; while from the peculiar lesions which are associated with it, the terms enteric fever and intestinal fever have been suggested as appropriate synonyms for typhoid. Its latest name, for which Dr Murchison is responsible, is pythogenetic fever, or fever born of putrescence. If the term *intestinal fever*, suggested by Dr W. Budd, were adopted, much confusion would be prevented.*

Had our space permitted, we should have given a brief historical sketch of the principal epidemics of typhus fever. To confine ourselves to the present century, it may be mentioned, that during its first fifteen years the ravages of typhus in the armies of Napoleon, and among the population of the countries which were the seat of war, were perfectly appalling. In May 1812, the Bavarian army serving with the French numbered 23,000 men; in February 1813, the number was reduced to 2250, the great destroyer being typhus. In Mayence alone, of 60,000 French troops composing the garrison in 1813-1814, there died of typhus alone, in six months, 25,000 men. During the spring of 1856, more than 17,000 men of the French army in the Crimea perished from this disease in less than three months. According to Parkes, typhus fever occupies the fourth place amongst the causes which have produced loss of life in the British, the three more potent causes being (1) a defective commissariat; (2) undertaking military operations in an unhealthy site, and with an unhealthy season impending; and (3) exposure to cold, with insufficient clothing and food. The present article, comparatively long as it is, contains but a very meagre outline sketch of the history and treatment of two of the most important diseases affecting the human body.—For further details, the reader is referred to Aitken's "Science and Practice of Medicine," 3d ed., vol. i. pp. 374-474, and to Dr Murchison's "Treatise on the Continued Fevers of Great Britain" (1868).

TYR is the old Norse name of a god, who, however, did not belong exclusively to the northern mythology, but was common also to the German, being called in old High German *Ziu* or *Zio*, and in Ang.-Sax. *Tiu*. He was the son of Odin, and was the god of war and of fame, which idea is expressed in old Norse by the word *tyr*; and when the Romans and Greeks speak of a Mars or an Ares among the Germans, it is Tyr that is meant. According to the Edda, he was single-handed. When the Asa-gods persuaded the wolf Fenrir to allow himself to be bound with the bandage Gleipnir, Tyr put his right hand in the wolf's mouth, as a pledge that he would be loosened; and when the gods refused to release him, the wolf bit off Tyr's hand to the wrist, which was called, in consequence, *Ulfthr*, or the Wolf's Joint. In the twilight-battle of the gods, he meets his death at the same time with his enemy, the monster dog, Garmr. The old Norse Runic character † bore the name of the god.

The third day of the week, too, the *Dies Martis* of the Romans, is called after him, in old Norse, *Tyrdayr*; Ang.-Sax. *Tuesday* (from which our English *Tuesday*); old Frisic, *Tysdei*; old High German, *Ziwestag*; in the north of Germany, *Tiestag* or *Dinstag*, from which the German of the present time, *Dienstag*. Places, and in particular hills and plants, were named after him. The word Tyr appears in epithets of Odin, signifying god in a general sense; as, for example, *Stgtyr*, that is to say, the god of victory; also in epithets of Thor, as *Reidhartyr*, the god of the chariot or of thunder.

TYRANT (Gr. *tyrannos*, Doric for *kotranos*, from *kuros* or *kurios*, a lord or master), a name given in modern times to an arbitrary and oppressive ruler, but originally applied, not necessarily to one that exercised power badly, but merely to one that had obtained it illegally, and therefore equivalent to our word *usurper*. The ancient Greek "republics," it must be remembered, were generally aristocratic and even oligarchic in their constitution. When the "governing families" among the Athenian or Syracusan nobles, for example, quarrelled with each other, it was

* Cases of continued low fever, whether typhus or typhoid, are frequently spoken of popularly and vaguely as *gastric fevers*; but the term is not recognised by the medical profession.

Tyrant
Tyre

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natural, if they could not otherwise agree, that the boldest and most reckless of the set should seek for success by allying himself with the masses of the people, should figure as their champion, promise to redress their wrongs or increase their comforts, and when a fitting occasion presented itself, should, by a clever if somewhat violent stratagem—*coup d'état*, it is now called—deliver them from the domination of his order by himself grasping possession of absolute power, and ruling without any other restraint than the necessity of retaining his popularity imposed—even this limitation being frequently absent when a body-guard of foreign mercenaries rendered it superfluous. If the political adventurer who thus rose on the ruins of the constitution happened to be a man of sense, and wisdom, and generosity, his "tyranny" might prove a blessing to a state torn by the animosities of selfish oligarchs, and be the theme of praise in after-ages, as was the case with the "tyrannies" of Pelsistratos (q. v.), Gelon (q. v.), Hiero II. (q. v.), and many others; but if he was insolent, rapacious, and cruel, then he sought to reduce the citizens to a worse than Egyptian bondage, and his name became infamous to all time. Such has been the fate of most of the "Thirty Tyrants of Athens" (q. v.), more particularly of the blood-thirsty Critias, of Alexander of Phæræ, of Dionysius the Younger, &c. It was the method of exercising authority pursued by these and similar usurpers that latterly, even in ancient times, gave the word tyrant that evil significance it has ever since uninterruptedly retained.—See Plasz, "Die Tyrannis bei den Griechen" (Bremen, 1852); Wachsmuth, "Hellen. Alt.," vol. i. pp. 279–288; and the Histories of Thirlwall and Grote.

TYRANT SHRIKE, the popular name of a section of the Shrike family (*Laniidae*), connecting that family with the Flycatchers (*Muscicapidae*), and entirely American. In the genus *Tyrannus*, the bill is straight, rather long, strong, the upper mandible rounded above, the point suddenly hooked. The birds of this genus are remarkable for their fierce and bold disposition. They are always ready for battle, and often engaged in it. In defence of their young, they rush against any aggressor. The T. S., **TYRANT FLYCATCHER**, or **KING-BIRD** (*T. intrepidus*) of North America, has no hesitation in attacking an eagle, rising above him, and pouncing down upon him. This species migrates northwards in summer as far as lat. 57°. It feeds much on the larvæ of insects, but has an unfortunate fondness for bees, and will take its post on a fence or bush near a hive, to dart upon them as they depart or return; on which account it is disliked by American farmers. The true Tyrant Shrikes (*Tyrannus*) have the plumage of white and black, variously blended; but in the genus *Tyrannula*, which approaches more to fly-catchers, the plumage is almost always olive-colored, serving for their concealment among foliage.

TYRCONNEL, Richard Talbot, Duke and Earl of, born early in the 17th century. In his youth, according to Lord Macanlay, he was "one of the most noted sharpers and bullies of London." Soon after the Restoration, he endeavored to obtain the favor of the royal family by blackening the reputation of Anne Hyde, so as to furnish the Duke of York with a pretext for breaking his promise of marriage to her. Though unsuccessful in this, he succeeded in gaining the favor of the duke, and contrived to make himself welcome at the palace both as a votary of its pleasures and as a counsellor in affairs of state. Immediately on the accession of James II., he was made Earl of T., and put in command of the troops in Ireland; and in 1687, by fawning, bullying, and bribing, he got possession of the office which had long been the object of his ambition—he was appointed Lord-deputy of Ireland. His arrival in that country spread terror and dismay through the English Protestant population, who had already suffered somewhat under his military rule. Events quickly justified their terrors. Nearly every office of dignity in the country was soon transferred to the hands of the Roman Catholics. The Protestant party, so long dominant, complained bitterly that they had become a laughing-stock even to their own servants, and that to appeal to law was vain; judgment in every case being given for the native against the Englishman. But this state of matters did not last long. The revolution of 1688 had a sudden and sobering effect upon the rule of the Lord-deputy; and there can be little doubt that he would have submitted to William III.; but the Irish people threatened that if he dared to sell them for wealth or honor, they would burn the castle and him it, and put themselves under the protection of France. On the arrival of James in Ireland in 1689,

he created the earl, Duke of Tyrconnel. After the fatal battle of the Boyne, at which he held high command, he retired to France. In 1691, he returned to Ireland, with a view to furthering the efforts in favor of James, which were still being made by his adherents. Notwithstanding the defeat of Aghrim (12th July 1691), and the capitulation of Galway, he made preparations for the defence of Limerick, binding himself and his countrymen by an oath not to surrender until they received permission from James, then at Saint Germain. He at the same time despatched a letter in which he stated his conviction that all was lost. On the 11th August, before an answer could arrive, he was struck with apoplexy. He died on the 14th of the same month. He has been characterised by Macaulay as "the fiercest and most uncompromising of all those who hated the religion and liberties of England." He was survived until 1730 by his wife—"La belle Jennings" of the court of Charles II. This lady, so famed for her beauty and fascinating manner, entered life as maid of honor to the Duchess of York; in which position she conducted herself with a propriety which, time and place considered, may almost be pronounced unique. As wife of the Duke of T., during his rule in Dublin, her conduct seems to have been characterised both by dignity and purity. It is narrated that when James and her husband, fleeing from the defeat of the Boyne, reached her residence so bespattered with mud as to be scarcely recognisable, she dressed herself richly, and received the fugitive king and his attendants with all the splendor of court etiquette. She died in a small private nunnery in Dublin in circumstances of great poverty.—See Macaulay's "History of England," vols. ii., iii., and iv.; Chambers's "Book of Days," vol. i. ed. 1863, p. 310; Mrs Jameson's "Memoirs of Beauties of the Court of Charles II.," vol. ii., p. 223.

TYRE (Phœn. *Sûr* or *Sôr*, rock), a city of ancient Phœnicia, situated in lat. 33° 12' n., which probably derived its name from the double rock on which it was first founded. It was a matter of doubt among the ancients themselves whether T. or Sidon was the older of the two, and the question is one not easily to be settled. So much, however, seems certain, that T. had existed already independently for a long time, when Sidon, defeated by Ascalon, transferred herself almost bodily to the former (see PHœNICIA). There were two towns of T. closely connected together in historical times; one on the continent, the other on the island opposite, together embracing about 19 Roman miles. The more important of the two was the continental town, called Pale Tyrus; while the island-town served more or less for the purpose of store-houses, manufactories, arsenals, and the like. The situation of the entire city was one of the most fertile, and its magnificent combination of land and sea scenery formed the theme of many an ancient poet and seer.

Nothing but myths have come down to us respecting the earlier period of its existence. History begins to dawn upon us with Abibal, the predecessor of the biblical Hiram, under whose rule (930—947 B.C.) T. attained to its full glory and renown. An alliance with Solomon was also entered into; trading expeditions were undertaken jointly by the Israelites and the Phœnicians, and Solomon is supposed even to have married Hiram's daughter. During Hiram's reign, T. was much enlarged and embellished; and its two roadsteads and harbors, the wonders of the ancient world, probably date from the same period. He was followed, according to ancient writers, by Baalæstartus; after him reigned, for brief periods, his four sons, by the murder of the last of whom the throne became hereditary in the House of Ithobaal, the Ehibani of Scripture, whose daughter was married to Ahab. T. then appears to have gained the supremacy over Sidon, and also spread her colonies far and wide. Shortly after the death of this king, Carthage was refounded by Elissa (Dido), about 813 B.C., in consequence of a popular demonstration, which deprived her of the throne in favor of Pygmalion. This "new city" gradually diminished the importance of the old one; at least T. seems to have been weakened to such an extent by the emigration of its best elements, that it disappears from history until the three great powers, Chaldeæ, Assyria, and Egypt, by turns endeavored to make themselves masters of the Tyro-Phœnician coast, with its eastern and western trade. Shalmaneser, king of Assyria, reduced T., after a long siege; and the whole of Phœnicia, the most important places of which had already thrown off their allegiance to T., was rendered tributary to Assyria. During the Chaldeo-Egyptian struggle, T., again at the head of the country, sided with Egypt, and was conquered by the Chaldeans. Once more

the Phœnicians attempted to throw off the foreign yoke, and Nebuchadnezzar marched against them at the head of his armies. Having taken Jerusalem (587 B.C.), he reduced the whole sea-coast, except T., which stood a thirteen years' siege by water and by land, ending, not in subjection, but only in a kind of apparent submission, leaving the native sovereigns on their thrones, and their wealth and power untouched. In 538 B.C., Cyrus became master of Phœnicia, which at that time again stood under Babylonian supremacy, and the hegemony was bestowed upon Sidon. For a long time, Phœnicia prospered under wise Persian rulers; but when Xerxes, in his Greek wars, had completely destroyed the Phœnician fleet, and exhausted nearly all her resources, the exasperated inhabitants rose once more, but only to be utterly crushed. Sidon, at the head of the revolution, was fired by its own inhabitants, and once more T. resumed the lead (350 B.C.). Having refused to pay allegiance to Alexander the Great (after the battle at Issus), it was besieged by him in 332 B.C., and fell after a seven months' hard resistance. Alexander replaced the old inhabitants by new colonists, chiefly Carians, and though the city had sustained all but complete destruction, it yet rose again after a very brief period to wealth and power, and already in 315 B.C., was able to hold out for 18 months against Antigonus. Under the Romans, Cleopatra received T. as a present from Antony; but the last trace of its independent existence was taken from it by Augustus. A Christian community was founded there at an earlier period. The trade and manufacture of T., aided by her exceptionally favorable naval position, insured for it, even under Roman dominion, a high place among its sister cities; and once more, in 193 A.D., it even took an active part in the contest between Septimius Severus and Pescennius Niger, which, resulting in the success of the former, brought back to it some of its ancient distinction. In St. Jerome's time, it was again the noblest and most beautiful city of Phœnicia, nay, one of the most prosperous and noble cities of the whole East. In the 7th c., it came under the dominion of the Saracens, and so remained until taken by the Crusaders; and in 1192 A.D. became the northern boundary of Christian territory in Palestine. It continued to flourish—still chiefly through its world-renowned purple—until 1516 A.D., when the conquest of Sella L., together with the newly-discovered route to Asia by the Cape of Good Hope, put an end to its wealth and commerce, and almost to its existence. Although there has been a slight improvement in its prospects of late, the desolation and wretchedness of that once magnificent city are still most striking. From 3000 to 4000 inhabitants now dwell among the ruins of its ancient glory, finding scanty livelihood in insignificant exports of tobacco, cotton, wool, and wood. Frederick Barbarossa and Origen are both buried here.

TYRNAU (*Magyar Nagy-Szombath*), a town of Hungary, county of Ober-Nentra, on the river Terna, about 30 miles north-east of Presburg. It has so many churches and convents that it has been nicknamed "Little Rome." T. carries on manufactures of cloth, linen, wool, &c., and has a tolerably lively general trade, especially in wine. From 1635 to 1774, it possessed a university, which in the latter year was transferred to Pesth. T. is likewise famous for a huge cask, which can hold twice as much as the great Heidelberg one. Pop. (1869) 9737.

TYROL (In German more commonly spelt *Tirol*; not spoken of as *das T.*, though usually called in England *The T.*) forms with Vorarlberg the most westerly province of the Austro-Hungarian monarchy, and borders n., w., and s. on Bavaria, Switzerland, and Italy. Area, including Vorarlberg, 12,311 sq. miles; pop. in 1869, 883,789.

Surface.—The T. may be regarded as an eastern continuation of Switzerland. It is traversed from east to west by the great chain of the Alps, and is encircled on all sides by lofty ranges. It consists, however, almost entirely of three great valleys.—(1) one running east and west north of the Great Alps, and drained by the Inn; (2) one south of the Alps, also running east and west, and drained by upper tributaries of the Adige or Etsch; (3) one running south from the middle of the last, and drained by the main stream of the Adige. These valleys are surrounded by a circuit of mountains. The northern valley is separated from Bavaria by the Algan Alps. The southern valley is bounded on the e. by the Trent Alps; on the w. by the Orlier Alps, which, like protecting walls, run south into the plain of Lombardy. The main chain is crossed towards the centre of the T. by a deep depression, in which lies the

Brenner Pass (elevation, 4657 feet). It is the lowest of the great passes of the Alps, and that over which runs the great commercial route connecting Italy and Germany.

The dialect and manners of the Bavarians prevail in the northern and middle valley. The dialect and manners of Lombardy, on the other hand, have crept up the third valley to a boundary-line which rests upon the mountains which bound the middle valley on the south. Hence the most important divisions of the T. are into the German Tyrol and the Italian Tyrol. The German T. is divided into (1) the Oberinntal, or the Upper Inn Valley; (2) the Unterinntal, or the Lower Inn Valley; (3) the Vintschgau; (4) the Etach district; and (5) the Pustertal, the three last belonging to the middle valley of the Tyrol. Beyond the geographical limits of the T., the Austrian province of the T. includes (6) the Vorarlberg, a district drained by streams which fall into the Lake of Constance, and in which a dialect is spoken resembling those of German Switzerland; and (7) the Lienz district, on the Drave, in which the language of the people is Austrian. The Italian T. is divided into (1) a northern valley, or that of Trent; (2) a southern valley, or that of Roveredo; (3) the valley of the Sarca, or district of Riva, on Lake Garda.

Geology and Soils.—The rocks of the T. are chiefly crystalline Silurian and Secondary, with obtruding granites and traps. The chief mineral products are iron, rock-salt, worked near Innsbruck, and marble, quarried in the south. The Tertiary strata of the Swiss and Swabian plains are totally wanting; and it is only along the water-courses that level tracts of recent formation are found. These tracts are the only parts of the country admitting of cultivation by the plough, and they very seldom attain a width of more than half a mile. Taken altogether, they do not form more than one-tenth of the whole country.

Climate.—The loftiest mountains of the T. are in the main chain of the Alps—the Gross Glockner (12,776 feet), east of the Brenner Pass, and Mount Gebatsch (12,376 feet) west of it, and, in the Ortler chain, the Ortler Spitz (12,818 feet). These mountains are covered with vast glaciers, which descend, like those of Switzerland, far into the valleys. Between 6000 and 5000 feet, snow disappears in summer, and alpine plants and grass cover the hills, diversified here and there with stunted bushes. Into this region the herds are driven, as in Switzerland, during the summer months. Below 5000 feet, the fir-woods abound; potatoes and a few vegetables are cultivated, and houses permanently occupied make their appearance. The beech replaces the fir at 4000 feet, and agriculture begins, the chief grains being rye and barley. Wheat is not cultivated with success at a higher elevation than 2000 feet. In the lower part of the southern valley, the temperature is highest, and indeed the climate is that of Northern Italy; tobacco, the fig, the olive, and the mulberry being enumerated among the chief objects of cultivation. Out of every 100 acres of the T., 30 are inaccessible mountain-tracts, 40 forests, 20 commons and meadows, and 10 cornfields and gardens.

Industry.—The industry of the T. is not important. There are, however, glass and paper factories near Innsbruck; and carpets, linens, gloves, and straw-hats are manufactured extensively for home consumption. Wooden ware is also largely produced. The rearing of canaries is a business which was long a monopoly of the northern Tyrolese, who supplied all Europe with these birds. The exports from the T. consist of cattle, cheese, timber, wine, tobacco, silk, iron, and salt. The imports are grain and manufactured goods. The transit-trade between Italy and Germany gives employment to a large number of the inhabitants. Thousands migrate annually into neighboring countries, to sell their wood-wares, gloves, and carpets. Railways have for a number of years connected Innsbruck with Munich, and Bozen with Verona; and in 1867 the section between Innsbruck and Bozen, over the Brenner Pass, was opened, which completed the first railway communication between Italy and Germany.

Inhabitants.—The northern or German Tyrolese bear to the southern, or Italian, the proportion of three to two; and the habits and language of the people resemble those of the adjoining parts of Italy and Germany. In the T., according to the census, the inhabitants are all Catholic, with the exception of 358 Jews, 1235 Protestants, 29 Greek Christians, and a few members of other sects. The Tyrolese have an independent national diet, meeting at Innsbruck, in which are represented all classes of the population, the clergy, the nobility, the people of the country, and those of the towns. There are, to some extent, separate administrative arrange-

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ments for the Italian districts. Education is now very generally diffused, and one of the nine Austrian universities is at Innsbruck.

History.—The history of the T. is partly German and partly Italian. In early times, the T. formed part of Rætia, and was conquered by the Romans, 15 B.C. Subsequently it was overrun by various German tribes; still later the southern valley fell to the share of the Lombards; the two northern valleys to the Bavarians. The latter valleys were divided into *gaus*, which ultimately became petty lordships, acknowledging the supremacy of the dukes of Bavaria. These lordships, however, in the course of time, came to be represented by two families who intermarried. Then the whole German T. was governed by one family of counts, whose paternal abode was the mountain fortress of Teröll, or Tyrol, near Meran. The last count, who died in 1386, left one daughter, Margaret Mautsches. She bequeathed her rights to her cousins, the dukes of Austria, who, in consequence, acquired possession of the T. in 1386. The Italian valley formed the bishopric of Trent. During the wars of Napoleon, the German T. was ceded to Bavaria, much to the discontent of the population, who were warmly attached to the House of Austria. They made a gallant resistance to the French in 1809, under Andreas Hofer, but were defeated; and the Northern T. was not restored to Austria until the Treaty of Paris in 1814. The Southern T., which had been annexed to Italy, was restored to Austria in the following year. An application was made by the inhabitants of the Italian T., a few years ago, to the Austrian government to be rendered entirely independent of the German inhabitants of the northern valleys; but it led to no important change in the administration. It shewed, however, the desire of the Southern Tyrolese to be considered Italians rather than Germans, and it was believed that on the event of a successful war for the recovery of Venice, the whole of the Southern T. would be handed over to the kingdom of Italy. This expectation has not been realised. By the treaty of peace between Austria and Italy, at the conclusion of the war through which Venetia again became Italian, it is declared that the frontiers of the Venetian provinces ceded to Italy are the administrative frontiers of these provinces under the Austrian rule. Even the shores of Lake Garda remain Austrian. How long this arrangement will last, it is hard to predict. The trade of the Southern T. is entirely with the south, its wood and cattle being exchanged for the corn of Lombardy, and it is asserted that if any attempt is made to enforce custom-house regulations on the frontier, the inhabitants will not rest satisfied until they have secured the annexation of their territory to Italy.

TYRO'NE (*Tir-owen*, "Owen's country") an inland county of Ulster, Ireland, bounded n. by Londonderry, e. by Armagh and Lough Neagh, s. by Monaghan and Fernmanagh, and w. by the last-named county and Donegal. A portion of Lough Neagh is assigned by the Ordnance Survey to this county; and, including this portion, the whole area is 1260 sq. m., or 806,640 acres, of which 450,236 are arable, 811,867 uncultivated, 31,796 under water, 11,931 in plantations, and 710 in towns. The pop. in 1871 was 215,766, of whom 119,937 were Roman Catholics, 49,201 Protestants of the Anglican Church, 42,156 Presbyterians, and the rest of other denominations. Of the arable land, in 1875, 256,773 acres were under crops of various kinds. In the following year, the stock amounted to 25,111 horses, 175,824 cattle, 45,270 sheep, and 48,993 pigs. The surface, in general, is hilly, and often extremely picturesque, this county lying for the most part between the two great mountainous districts which traverse Ulster from east to west. With the exception of Lough Neagh, the lakes, which are numerous, are small. The principal rivers are the Blackwater, the Camowen, and the Ballinaderry, of which the two former are navigable. The county is traversed by railways, which connect it with Dublin, Belfast, and the sea-coast at Dundalk. The geological structure is very much diversified. The north-western mountains are chiefly mica-slate, with primitive limestone, and rise in Slieve Sawel to a height of 2236 feet. Those on the north-east are of greenstone, with granite and occasional red sandstone. The plain, of which Omagh is the centre, is a Tertiary formation, with irregular beds of lignite, red marl, and new red sandstone; and between Dungannon and Stewartstown there is a small coal-field, the produce of which is rich, and resembles the coal of Ayrshire. The rest of the plain belongs to the general limestone district. The climate is moist, and the low lands are often flooded. The soil of the plain is a fertile loam; that of the hilly districts, sandy or gravelly.

There is a large proportion of bog, the turf of which supplies the chief part of the fuel consumed by the population.

The chief towns are Omagh, Strabane, Dungannon, Cookstown, Aughnacloy, Castlederg, and Clogher, which gives its name to the episcopal see. T. returns three members to the imperial parliament, two for the county, and one for the borough of Dungannon.

T. was anciently known as the district of Hy-Brian and Hy-Flachra; and in later Celtic times was called Kinel Eogain, or Tír-owen, whence its modern name. See ULSTER.

TYRRHENIAN SEA (anc. *Tyrrhenum Mare*), that part of the Mediterranean Sea (q. v.) between the islands of Corsica, Sardinia, and Sicily on the west, and the Italian peninsula on the east.

TYRTÆUS, famed for his political elegies and marching-songs, was the son of Archembrotus, of Aphidus in Attica; according to another conjecture, he was a Lacedæmonian; while the story which represents him as a lame schoolmaster, of mean family, whom the Athenians (ignorant of his lyric power, and jealous of Lacedæmonian domination in the Peloponnesus) sent to the Lacedæmonians, during the second Messenian war, as the most inefficient commander they could select, must be received as a fiction of later times. He rendered, however, to the Lacedæmonians a kind of assistance which the Athenians little foresaw; and while by his elegies he stilled their dissensions at home, by his war-lyrics, he so animated their courage in the field, that they were finally triumphant in their conflict with the Messenians, whom they reduced to the condition of Helots. This success of his poems T. lived to see, and must accordingly have flourished down to 668 B.C., the last year of the second Messenian war. The best edition of the text of T. is that of Bergk in his "Poeta Lyrici Græci."

TYTLER, William, the author of several literary works of considerable merit, the principal being an "Inquiry, Critical and Historical, into the evidence against Mary Queen of Scots," in which it is attempted to vindicate that unhappy princess from the charges brought against her by Robertson and Hume. T. was born at Edinburgh, in 1711, educated in Edinburgh, admitted a member of the Society of Writers to the Signet in 1749, and died in 1792. He was father of Alexander Fraser Tytler, Lord Woodhouselee, and grandfather of Patrick Fraser Tytler the historian. T. was an accomplished musician, and distinguished for his general culture and taste in the fine arts.

TYTLER, Alexander Fraser, a historical writer, and a judge of the Court of Session in Scotland under the title of Lord Woodhouselee. He was the eldest son of William Tytler (q. v.), the vindicator of Queen Mary, and was born at Edinburgh in 1747, educated principally in Edinburgh, and admitted to the Scottish bar in 1770. He obtained, in 1780, the professorship of History in the university of Edinburgh; in 1790, the office of Judge-admiral of Scotland; and in 1802, was raised to the bench of the Court of Session. His acquirements were of the most varied kind, embracing most departments of literature and the fine arts. His writings include a biography of Henry Home, Lord Kames; a Dictionary of Decisions of the Court of Session; and the work by which he is best known, his "Elements of General History," first published in 1801, which has been translated into most of the languages of Europe, and even in to Hindustani. He died in 1813.

TYTLER, Patrick Fraser, an eminent historical writer, fourth son of Alexander Fraser Tytler, Lord Woodhouselee. He was born in 1791, educated partly in Edinburgh, partly in England, and called to the Scottish bar in 1813. Of his various literary and historical works, the most valuable is his "History of Scotland," beginning at the accession of Alexander III., and terminating at the union of the crowns, a book of more critical research than any work on the same subject that had preceded it. His writings also include a life of the Admirable Crichton, a life of Wickliffe, a memoir of Sir Thomas Craige, and a collection of original letters, illustrative of the reigns of Edward VI. and Mary. In consideration of his merits as a historian, Sir Robert Peel's government conferred on him a pension of £200 a year. He died at Malvern, 24th December 1849. His talents were such as qualified him in a remark-

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able degree to shine in society, and his amiable and excellent private character have been the subject of deserved eulogy.—See Burgon's "*Life of Patrick Fraser Tytler*" (1859).

TZETZES, Johannes, a Byzantine (Greek) author, flourished during the latter half of the 12th c., is known as the author of certain works in prose and verse, which, though excessively dull, and without a vestige of literary genius, are valuable as store-houses of classical information, not elsewhere to be had. The principal are—1. "*Illica*," consisting of three distinct poems, entitled "*Ante-Homerica*," "*Homerica*," and "*Post-Homerica*;" or in Greek, *Ta pro Homerou, ta Homerou, kai ta meth' Homerou*; a complete edition of which was first published by Fr. Jacobs (Leip. 1793), but the most critical edition is that of Bekker (Berl. 1816); 2. "*Biblos Istorike*," more commonly called "*Chiliades*," or a collection of more than 600 stories, mythical, legendary, &c.; best edition that of Kiessling (Leip. 1826), written in that worthless sort of verse, called *political*, which had regard only to syllables, and not to quantity; besides commentaries on Homer, Hesiod, and the "*Cassandra*" of Lycophron. Several poems and commentaries of T. exist in MS., that have never yet been published.—T. had a brother Isaac, who probably had some share in the commentary on the "*Cassandra*."

U

U, the twenty-first letter of the English alphabet, represents in that language three distinct sounds, as heard in *tube*, *tub*, and *full*. The last is its primitive sound which it had in Latin, and which it has preserved in German and Italian, but which is oftener denoted in English by *oo*. In *tube*, it does not mark a pure vowel sound; it is aspirated, as if *y* were prefixed—*tyub*. The sound heard in *tub* is characteristic of English; and, owing perhaps, to the decided emphasis given to one syllable of a word at the expense of the rest, there is a tendency to allow the other vowels, *a*, *e*, *o*, when unaccented, to degenerate into this indistinct, stifled sound: *cavalry*, *sister*, *fashion* are pronounced almost, if not altogether, as if written *cavulry*, *sislur*, *fashun*. This is especially the case with *o*; and in this vowel the degeneracy is not confined to unaccented syllables; in a whole host of words, the accented *o* is exactly equivalent to *u*—e. g., *come*, *money*, *among*. Perhaps a similar tendency in Latin may account for the prevalence of *u* in that language as compared with Greek—e. g., Lat. *genus* = Gr. *genos*; *volumus* = *boulometha*; *spatula* = *spatula*; *scopulus* = *skopelos*. *U*, in Latin, sometimes goes into the still thinner sound of *i*; thus *maximus*, *capitis*, degenerated into *maxinus*, *capitis*. Of the labial series of vowels (see LETTERS), *u* approaches nearest to the labial consonants; so much so, that in Latin the vowel *u* and the consonant *v* were both denoted by the same character, *v*, of which *u* is only a later modification. In the middle ages, the two characters were used indifferently whether as vowel or consonant; and it was only in the 16th c. that the Dutch scholars fixed the use of the character *u* for the vowel, as distinct from *v*.

UBE'DA, a town of Spain, Andalusia, in the modern province of Jaen, stands on an olive-clad slope in a cultivated plain, 26 miles north-east of the town of Jaen. It contains some fine specimens of architecture, of which the chief is the cathedral. It was built by the Moors, and under them it is said to have contained 70,000 inhabitants. There are now only about 15,000, who are engaged in agriculture, in the manufacture of porous vessels, made of red and white clay, and in trade in the products of the fertile vicinity.

UCAY'ALI, a great river of South America, one of the chief head-waters of the Amazon. It joins the Amazon from the south, in south latitude 4° 40', and west longitude 73° 30', opposite the town of Nauta in Ecuador; but the whole course of the river is in Peru. It is the largest river that joins the Amazon above the Brazilian territory, and on account of its length, has been regarded by some as the main stream of the Amazon, but at its mouth it is not above half the width of the Amazon. The Marañon and Huallaga from the south, with many smaller but still large rivers from the north, have united to form the Amazon. The sources of the *U*. are in the Andes, Cuzco being situated on one of its feeders, which rises considerably further south; whilst another has its rise on the western side of the Andes, to the north-west of Lima, and after flowing southward for about 150 miles, makes its way through a cross valley, and takes a northward course. Attention has of late been very strongly directed to the *U*. as affording means of communication between the western parts of Peru and the Atlantic Ocean. It was partially explored by the Count de Ouselehan and others in 1846, by Lieutenant Herndon and Mr Gibbon of the United States navy in 1851, and more recently by an expedition sent out by the Peruvian government. It has been found to be navigable by steamers from its mouth to towns not far distant from Lima, 8700 miles from the mouth of the Ama-

zon. On the branch which comes from Cuzco, there are falls and rapids, which form an impediment to navigation more than 100 miles below that city. The course of the U. is winding, but generally northward. Without regard to any but its principal windings, the length of its course is not less than 1100 miles. It receives many large branches. The name U. is not given to any of its head-waters, the chief of which is the Tambo, formed by the junction of the Mantaro, a river which has its sources to the north-west of Lima, and the Apurimac, which comes from a more southern region. The greater part of the country through which the U. flows is covered with forest; but it seems very suitable for colonisation, if easy communication with the rest of the world were established, the soil being fertile, whilst the mountains abound in valuable minerals.

U'DAL RIGHT, in the Law of Scotland, means that right in land which may be completed without charter and sasine by undisturbed possession provable by witnesses before an inquest. Though dependent on the crown as superior, the vassal pays only a tribute called *skat*. The right is said to have been the old *tenure* prevalent in Britain before the feudal system was introduced, and prevails chiefly in Orkney and Shetland. The lands held on udal right are now commonly converted into fens.

UDI'NE, a city of N. Italy, Venetia, in the province of the same name, formerly called also the province of Friuli, situated in a fertile plain, about 75 miles north-east of Venice by railway. It is a walled town, 4 miles in circumference, with wide, handsome streets and squares. The castle, which stands on a hill in the midst of the city, was formerly the residence of the patriarchs of Aquileia, and is now the seat of the tribunals. The Antonini Palace is a work of the architect Palladius. U. trades in silks, in copper utensils, and rosolio. There are leather, paper, and silk factories. Pop. (1872) 29,630. Two miles from U. stands the village of Campoformio, where, in 1797, the treaty between Buonaparte and Austria was signed, by which Venice was ceded to the latter. Pop. of prov. (1871) 491,586.

U'FA, a government of Russia, formed in 1865 out of the five north-western districts of Orenburg, and separated from the present government of Orenburg by the south-west branch of the Ural Mountains. Pop. (1870) 1,864,925. See **ORENBURG**.

UFA, capital of the government of the same name, on the right bank of the Bielaia, or White River. It was built in 1578, in the reign of Ivan IV. It contains 12 churches and 24 manufactories, the principal articles of trade being honey, wax, fat, furs and skins. The Bielaia, an affluent of the Kama, and thus connected with the Volga, is here navigable for large ships. Pop. (1867) 20,166.

UGLITCH, a town of Great Russia, in the government of Jaroslavl, on the right bank of the Volga, 433 miles south-east of St Petersburg. In early times, it was the chief town of an independent principality of the same name. After the assassination of U. of Prince Dimitri, son of Ivan IV., in 1592, the majority of the inhabitants of the town were banished to Siberia and other distant quarters, and the town, formerly prosperous, became deserted. U. contains 24 churches, 2 cloisters, and 14 manufactories—linen, weaving, and tanning being the principal branches of industry. Pop. (1867) 13,272.

UGOLINO DELLA GHERARDESCA, Count, an Italian nobleman of the 12th century, chiefly known for his cruel death, which Dante has immortalised in his "Inferno." U. was for a time the head of the party of the Guelphs at Pisa, but a conspiracy, led by Archbishop Ubal dini, a Ghibeline leader, was formed against him, and with his sons and grandsons he was cast into the tower of Gualandi, and left to perish miserably by starvation.

UHLAND, Joh. Ludwig, a celebrated German poet, was born at Tübingen, 26th April, 1787, studied at the university of his native city, and first appeared as a writer of verse in Seckendorf's "Musen-almanach" (1806—1807). For several years he continued to publish ballads and other lyrics in various periodicals, the first collection of which, under the title of "Gedichte," appeared in 1815. To this he kept adding all the rest of his life, and it is on these "Gedichte" that his fame rests. Their popularity has been, and continues to be as great as it is merited, upwards of a dozen editions having been published. Other productions of U.'s are his admirable essays, "Ueber Walther von der Vogelweide" (Stuttg. 1822), and "Ueber den

Mythus der nord. Sagenlehre vom Thor (Stuttg. 1886) ; a masterly collection of old popular songs ("Alter hoch und niederdeutscher Volkslieder" (Stuttg. 1844—1845) ; and two dramas, "**Herzog Ernst von Schwaben**" (Heidelb. 1817), and "**Ludwig der Baier**" (Berl. 1819). He died at Tübingen, 13th November 1862. U. was a patriotic politician as well as a poet. He entered the representative assembly of Württemberg in 1819 as deputy from Tübingen, and proved an active member of the liberal party. He was also a delegate to the Frankfurt Assembly of 1848 ; but though Germany has reason to be grateful for his services to the cause of constitutional liberty, it is as a poet he will be best remembered. His pieces are full of spirit, imagination, and truth, finely picturesque in their sketches of nature, and exquisite in their varied tones of feeling. Nothing, indeed, can surpass the brevity, vigor, and suggestive beauty of his ballads, in which a romantic sweetness of sentiment and a classic purity of style are happily combined. U. is the acknowledged head of the "Swabian School" of German poets. See Pfizer's "**Umland und Rückert**" (Stutt. 1837). Longfellow has translated some of U.'s ballads, in his "**Hyperion**," into English ; and Mr Platt has published a volume of translations (Lond. 1848), with a memoir prefixed.

UHLANS (a Polish word signifying "lancers"), light cavalry of Asiatic origin, were introduced into the north of Europe along with the colonies of Tartars who established themselves in Poland and Lithuania. They were mounted on light active Tartar horses, and armed with sabre, lance, and latterly with pistols. Their lance was from 5½ to 6½ feet in length, and like that of the modern "lancers," was attached to a stout leather thong or chord, which was fastened to the left shoulder, and passed round behind the back, so as to allow the lance to be conched under the right arm. Immediately below its point was attached a strip of gaudy-colored cloth, the fluttering of which was designed to frighten the enemies' horses. The early dress was similar to that of the Turks, and the regiments, or *polks*, were distinguished from each other by the red, green, yellow, or blue color of their uniforms. The Austrians and Prussians were the first to borrow this species of cavalry from the Poles. In 1784, an attempt was made by Marshal Saxe to introduce the U. into France, and a "polk" of 1000 men was formed ; but it was disbanded at its author's death. The Prussian Uhlaus won great renown in the Franco-German War of 1870—1871 by their bravery and marvellous activity. The Prussians applied the term, however, rather loosely, including all their light cavalry under the designation.

UIST, North and South, two islands of the Outer Hebrides, are situated from 15 to 18 miles west of the Isle of Skye, from which they are separated by the Little Minch. Unlike the other islands of the Hebrides, the east coasts of North and South U. are much and deeply indented, while the west coasts are, as a rule, almost unbroken.—**NORTH U.**, between which and **SOUTH U.** the island of Benbecula intervenes, is 18 miles long from west to east, and from 10 to 3 miles in breadth. The eastern half of it is so cut up by lochs and watercourses as to have the appearance of an archipelago. This region is a brown, peaty, dreary bog, partly relieved, however, by a line of low hills running along the coast at the distance of about 2½ miles. In the west part, which, as a rule, is hilly, there is a tract of uneven, low land, exceedingly beautiful in certain seasons, rendered fertile by the drifting of shell-sand from the coast, and producing good clover and grain crops. Pop. (1871) 3222.—**SOUTH U.**, 20 miles long, and 7 miles broad. Its east coast is much indented by the lochs Skipport, Eynort, and Boisdale. The eastern district is upland ; the western is alluvial and productive, under proper treatment. Pop. (1871) 3669, engaged, like the inhabitants of North U., in fishing and agriculture.

UJJAIN, one of the seven sacred cities of Hindustan, in Sindia's dominions, of which it was formerly capital, stands on the right bank of the Sipra, 85 miles north-north-west of Indore. It is surrounded by walls with round towers, is six miles in circumference, contains the grand palace of the head of the Sindia family, several mosques and mausoleums, an observatory, and an antique gate, supposed to date from before the Christian era. An active trade is carried on in cloths, opium, &c. The number of the inhabitants is not ascertained.

UJHELY-SATORALYA, or Satoralya-Ujhely, a market-town of Hungary, 105 miles n.w. of Pesth. It stands on the Hegyalya Mountains, contains several churches and a gymnasium, and is noted for its wine-culture. Pop. (1869) 9946.

UKASE, or Ukas (Russian *ukazat*, to speak), a term applied in Russia to all the

orders or edicts, legislative or administrative, emanating from the government. The ukases either proceed directly from the emperor, and are then called *imenny ukas*, or are published as decisions of the directing senate. Both have the force of laws till they are annulled by subsequent decisions. Many ukases are issued in the course of one reign; and as an immense chaos of ukases had accumulated since 1649 (the date of the last codification of laws), the Czar Nicholas ordered (1837) that a collation of them should be made. The result was a collection of laws in 43 volumes, which has been supplemented year by year by volumes of new ukases, and which, after the elimination of such ukases as are unimportant or of temporary authority, constitutes the present legal code (*svod*) of the Russian Empire. The *prikases* are imperial "orders for the day," or military orders given during a campaign.

UKRAÏNE (Slav. a frontier country or March), the name given in Poland first to the frontiers towards the Tartars and other nomads, and then to the fertile regions lying on both sides of the middle Dnieper, without any very definite limits. The U. was long a bone of contention between Poland and Russia. About 1696 the part on the east side of the Dnieper was ceded to Russia (Russian U.); and at the second partition of Poland, the western portion (Polish U.) also fell to Russia, and is mostly comprised in the government of Kiev. The historic U. forms the greater part of what is called Little Russia (a name which first appears about 1654), which is made up of the governments of Kiev, Tchernigov, Poltava, and Kharkov.

ULCERATION is "that part or effect of an inflammatory process in which the materials of inflamed tissues liquefy or degenerate, are cast off in solution or very minute particles from free surfaces, or, more rarely, are absorbed from the substance of the body."—Paget on "Ulcers," in Holmes's "System of Surgery," vol. I. p. 197. Generally speaking, however, the name of ulcer is not applied to any inflammatory result, unless the substance of a tissue deeper than the epithelial is exposed; and when the cast-off particles are only epithelial, the result is termed desquamation, abrasion, or excoriation, although the process may be essentially the same. Ulceration is closely allied to gangrene, the two processes differing in degree rather than in kind. "When the degenerate or dead substance," says Mr Paget, "is cast off in one or more portions visible to the naked eye, the process is usually called gangrene; when the portions are not so visible, or are quite dissolved, it is called ulceration." The degenerate tissues are always suspended or dissolved in a liquid, termed the "discharge," or "ichor," which varies in appearance and properties according to the cause and characters of the ulcerative process. "From some ulcers, e.g., the primary syphilitic, it is contagious; from many, it appears corrosive, exciting by its acidity inflammatory changes in the tissues with which it is in contact."

ULCERS (derived from the Latin *ulcus*, a wound) may be arranged either according to the constitutional or specific disease from which they are derived, or according to the characters which they present. According to the first system, we speak of ulcers as healthy, inflammatory, strumous, &c.; while, according to the second, they are named irritable, chronic, sloughing, &c. In this article, we shall adopt the former of these arrangements, as being, upon the whole, the most satisfactory, although each possesses its own advantages.

A common, simple, or healthy ulcer is such as is left after the separation of an accidental slough in a healthy person, and is merely a healthy granulating surface, tending to cicatrization. Its edges shelve gently down to the base, and are scarcely harder than the adjacent healthy skin. Their surface near the border is of a purplish blue that where the young epidermis modifies the color of the healing granulations; and within this, the granulations have a deeper hue than those at the centre, being most vascular where the cuticle is being chiefly developed. The discharge from such an ulcer is healthy or "laudable" pus. The only treatment required is a little dry lint, if there is much discharge; or the water-dressing, if the sore is comparatively dry. When the granulations are too luxuriant, they must be touched with nitrate of silver, and dressed with dry lint. *Inflammatory ulcers* differ less than most kinds from the above described common or healthy ulcers. They commonly arise from some trifling injury, such as a blow or slight abrasion of the skin, which, to a healthy person, would have done no harm. Their most common seat is on the lower half of the leg or shin. The surface is red, and bleeds easily; the discharge

is thin and watery; the edges irregular or shreddy; and the surrounding skin shews a red tinge, and is the seat of a hot and aching sensation. This ulcer most commonly occurs in the infirm and old, the ill-led and overworked. Hence constitutional treatment, good diet, and complete rest (with elevation of the limb) are here demanded, in addition to water-dressing or lead-lotion applied warm. *Serious ulcers* usually present very little discharge, exhibit granulations of a rusty red tint, and are surrounded by a dusky red area. Nourishing food, wine, bark, and the mineral acids are here required, and opium in small repeated doses is often serviceable. The local treatment must be of a stimulating nature; and in bad cases, Mr Paget recommends strapping the leg daily with a mixture of resin ointment and Peruvian balsam spread on strips of lint. *Strumous or scrofulous ulcers* usually occur as the consequence of scrofulous inflammation in the subcutaneous tissue or lymphatic glands. They most commonly occur in the neck, groins, cheeks, scalp, and the neighborhood of the larger joints. The discharge is thin and of a greenish-yellow tint. These ulcers are seldom very sensitive or painful. The general treatment must be that recommended for constitutional Scrofula (q. v.). Iodine, in some form or other, is the best local application. A poultice of bruised and warmed seaweed is a very popular remedy; but there is probably nothing so efficacious as tincture of iodine diluted with water till it causes only a slight discomfort, and applied three or four times a day. (About 30 drops of the tincture may be added to an ounce of water, to begin with). Of the numerous other species distinguished by Mr Paget, we shall briefly notice the *Varicose*, *Indolent*, and *Sloughing Ulcer*. *Varicose Ulcers* are connected with an enlarged or varicose state of the veins of the lower extremity, which weakens the parts, and renders them especially liable to ulceration. See *VARICOSE VEINS*. The *chronic, indolent, or callous ulcer*, beyond all doubt, gives more trouble to the poor-law medical officer and the workhouse surgeon than any other half-dozen surgical affections. It is usually seated in the lower half of the leg, and is most commonly of an oval form, with its long axis parallel to that of the leg. "Its base lies deep, and is flat, pale, or tawny and dusky, with very minute or no visible granulations. The margin is usually abrupt, or unequally shelving, and in its most characteristic form, strictly overlaid with opaque, white, dense epidermis."—Paget, *op. cit.* p. 217. Many volumes have been written on the proper means of treating this form of ulcer. The distinguished surgeon from whose Memoir we have so largely quoted, especially recommends opium, regulated pressure, and blistering. A grain of opium night and morning is usually sufficient. The pressure is applied with straps of adhesive or lead plaster on linen. The object of blistering is not only to stimulate the ulcer, but to soften its callous edges by causing absorption of part of the exudation with which they are infiltrated, and desquamation of the cuticle which covers them. The expediency of healing old ulcers of this kind has often been called in question, inasmuch as apoplexy, palsy, mania, and other serious diseases are said to have followed the healing of such ulcers. In the following cases, it may be decided that a cure should not be attempted. (1) If the ulcer be affected by the gout, having regular attacks of pain, returning at stated periods, and similar to what the patient has experienced from gout in other parts. (2) If an ulcer habitually occur whenever the constitution is disordered. (3) If the patient be very infirm and old; for under these circumstances the removal of a habitual source of irritation, or the diversion of a habitual efflux of blood, may prove fatal; and especially as very old ulcers have been known to heal spontaneously a short time before death. To these cases, specified by Sir E. Home, Dr Druitt adds (4) that of ulcers on the legs of stout women about the critical period of life, and displaying a tendency to discharge profusely as the menstrual discharge diminishes. To counteract these dangerous tendencies, the bowels should be freely purged during, and for some time after, the cure of an old ulcer; and if there are any symptoms of congestion in the head, a seton should be inserted in the back of the neck.

For the treatment of *Sloughing Ulcers*, we must refer to the article *SYPHILIS*.

ULEABORG, a seaport town of Russian Finland, capital of the government of the same name, stands on the south bank of the Ulen, on the eastern shore and near the head of the Gulf of Bothnia. It was founded in 1685, and the privileges of a port were granted to it in 1715. In 1822, it suffered severely from fire. The harbor has of late years become so shallow, that vessels are obliged to unload in the roadstead, four miles from the town. Pop. (1867) 7602, who are engaged in the dock-

Ulema
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yards, sawmills, and breweries of the town. In 1864, an English flotilla burnt the government property in the place.

ULE'MA, the collective name of a certain class of theological jurists in Turkey, who, as is the case in Mohammedan countries, derive their decisions from the Koran and its commentaries. The Ulema enjoys many privileges; he pays no taxes, cannot be condemned to death or deprived of his property by any court of law. He can only—eventually—be deposed and banished. The nlemas have to recognise, save their two immediate superiors (the *kadiasks* or *kadilesks*), only the mufti as their chief authority, whilst they are the superiors of all the Mollahs (q. v.) in the different provinces. The kadias form the lowest judicial class, and are subject to the mollahs in every respect.

U'LEX. See **FURZE**

ULFILAS (*Ulphilas*, *Wulfilas* = little wolf), the celebrated translator of the Bible into Gothic, was born about 318 A.D., of Marcomannian parents, north of the Danube, among a Gothic population. Consecrated bishop in 348, he was expelled by his heathen compatriots from his native place, and sought refuge, together with a number of newly-converted Christians, in Lower Mœsia. At the foot of the Hæmna, where he remained for thirty years. In 388 he went to Constantinople (whither he had gone once before to assist at a council in 360), and died there shortly afterwards. He was one of the chief lights of Arianism (see **ARIUS**), in the interest of which he exerted himself with the utmost energy. Nor was his political influence less felt among his Gothic countrymen; and the contemporaneous Greek historians, no less than those that followed within a short time after his death, are unanimous in attributing to him the largest share in the religious and social development of the Gothic population. His greatest work, however—one which will render his name famous for all ages—is his Gothic translation of the Bible, a work by which he contrived both to fix the Gothic language and to perpetuate Christianity among the Gothic people. Familiar with Latin, Greek, and Gothic, and accustomed to write in each of them, he undertook to render the whole Bible, with the exception of the two warlike books of Samuel and Kings—the influence of which he feared for his easily inflammable people—into a language which till then had, as far as we know, never been used for any literary composition of importance. Up to the 9th c., this sacred and national work accompanied the Goths in all their migrations. But from that period forth, nothing was known of it beyond what was found stated in the ancient ecclesiastical accounts. It was not till the end of the 16th c. that Arnold Mercator discovered in the Abbey of Werden the four gospels of Ulphilas. Thence it found its way to Prague, where it remained till 1648, when the Swedes took it as a spoil to Upsal, where it still remains in the University Library, under the name of the "Codex Argenteus." In 1818, further remnants of the work—a great portion of the letters of St Paul—were discovered by A. Mai and Castiglioni, on palimpsests, in a Lombardian monastery, which, added to a few minor fragments, bring the New Testament somewhat near completion. But hardly anything—save a few passages from Ezra and Nehemiah—has survived of the Old Testament. The immense importance of this sole Gothic remnant for Teutonic philology cannot be well overrated. It is principally through it that the wonderfully fine structure of Gothic—a Germanic dialect of surpassing wealth and purity—has become known.

ULLSWATER, after Windermere, the largest of the English "Lakes," lies between the counties of Cumberland and Westmoreland, 10 miles east of Keswick. Length, 9 miles; breadth, 1 mile. Its scenery has none of the soft beauty of that of Windermere, but is rugged and grand. One of the chief features of the landscape is the lofty mountain Helvellyn, which rises from the south-west extremity of the lake.

ULM, the second city of Württemberg, in 49° 54' n. lat., and 8° 8' e. long., was, till the war in 1866, a stronghold of the Germanic Confederation, garrisoned by troops of Württemberg, Austria, and Bavaria. It was long one of the most important imperial free cities. U. is situated at the junction of the Blau with the Danube, which then becomes navigable, 63 miles west of Augsburg by railway. Two bridges unite the city with New Ulm, a village on the Bavarian side of the river. The

streets are narrow, and the buildings old. Pop. (1871) 26,290; (1875) 30,222. The environs of U. are flat. The cathedral, which is a Protestant church, is remarkable for architectural beauty, and is, next to the cathedral of Cologne, the largest church in Germany. It is 475 feet in length, 165 in breadth, and 140 in height, the unfinished tower over the main entrance being 320 feet. The building was begun in 1377, and finished in 1494. There are good schools for the people, a gymnasium, high school, and trades' school, a public library, an agricultural society, and many charitable institutions. Leading industries are weaving linen, cotton, and woollen, and mixed fabrics; bleaching; making paper, leather; beer-brewing; ship-building; book-printing, &c. U. is famed for ornamental pipe-bowls, and pastry called Ulmer bread. Around the city, gardening is extensively carried on, and asparagus especially cultivated.

The Romans had a settlement at this important point. In 1531, the city accepted the Reformation, and the majority of the people have since been Lutherans. In 1902, U. was attached to Bavaria, and became part of Württemberg in 1910.

ULMA'CEÆ, a natural order of exogenous plants, regarded by some botanists as a sub-order of *Urticaceæ*. They are trees or shrubs, having rough alternate leaves, each leaf with a pair of deciduous stipules. The flowers are small and in loose clusters. The perianth is small, membranous, bell-shaped, irregular; the stamens equal in number to the lobes of the perianth, and inserted into their base; the ovary superior. The fruit is 1—2-celled, nut-like, or compressed and winged. There are about 60 known species, natives of temperate parts of the northern hemisphere. See **ELM**, **NETTLE-TREE**, and **ZELKOVA**.

U'LMIN. See **HUMUS**.

U'LNA. See **ARM**.

ULODE'NDRON, a singular genus of coal-plants, founded on stems which occur chiefly in the roof-shales. The stems are covered with small rhomboidal scars, as in *Lepidodendron*, formed by the bases of leaves or scales; but they differ remarkably from that genus in having a double series of large oval or circular markings, arranged linearly on the opposite sides of the trunk. These markings are variously interpreted as representing the cicatrices produced by the bases of cones, by branches, or by leaf-stalks. It is, like many of the coal fossils, an extremely enigmatical plant; and it is difficult to determine its position in the vegetable kingdom. It is probably an ally of *Lepidodendron*, and that is known to be a vascular cryptogam nearly related to *Lycopodium*. Seven species are known.

ULPIA'NUS, Domitius, a celebrated Roman jurist, of Tyrian extraction, flourished in the early part of the 3d century. The exact date of his birth, however, is unknown. He appears to have held juridical offices during the reigns of Septimius Severus and Caracalla, of which he was deprived by Elagabalus; but on the accession of Alexander Severus (223 A.D.), he became the principal adviser of that emperor, who appointed him *scriniorum magister* (keeper of the public records), a *consiliarius* (public assessor), and *præfectus annonæ* (superintendent of the corn-market). He also held, during the reign of Alexander Severus, the important post of prefect of the Prætorian Guards, though it is uncertain whether that monarch first conferred it upon him. He was murdered by his own soldiery, 238 A.D. U. was both a voluminous and a valuable writer. In the "Digest" of Justinian, there are no fewer than 2462 excerpts from him, many of which are of considerable length. Altogether, they form about a third of the whole body of the "Digest." Unfortunately the originals have almost entirely perished. The principal were—"Ad Edictum" (33 books), "Ad Sabinum" (51 books), "Ad Leges Juliam et Papianam" (20 books). The so-called "Fragmenta" of U. (first published at Paris by Tilpin in 1549) consist of 29 titles, whence they are called in the Vatican MS. "Tituli ex Corpore Ulpiani." The best edition is Böcking's (Bonn, 1836).

ULRIC, St. Bishop of Augsburg, and venerated as one of the Fathers of the German Church, was born at Augsburg about the year 890. His father, Hupald, was one of those counts of Dillingen who play so important a part in mediæval German history, and U. himself owed part at least of the extraordinary influence which he exercised in his time, to the distinguished rank of his family. He was educated in the

celebrated Benedictine monastery of St Gall (q. v.) in Switzerland; but his later life, and the character of his mind, as well as the tendency of his religious views, appear to have been influenced less by his monastic instructors, than by the counsels of a remarkable female recluse named Wiborada, whose cell was in the vicinity of St Gall, and with whom he formed a close association. It was by her counsel that, instead of adopting the Benedictine habit at St Gall, he devoted himself to the secular ministry and returned to his native diocese of Augsburg, where he received holy orders. In accordance with the usage of his time, he made a pilgrimage to Rome, and soon after his return, was consecrated Bishop of Augsburg, on the death of Hilfene in the year 923. The details of his history as administrator of this church, which had suffered serious disorganisation through the Magyar invasion and other wars, would be out of place here; but they are related with much circumstantiality by his contemporary biographer; and they throw so much light as well on the external as the religious life of the time, as on the moral and spiritual character of the people, laity as well as clergy, as to merit the most serious consideration of every student of medieval history. Bishop U. bore an important part in the public affairs of the empire during the reign of Henry I. and his son Otto; and he was the guiding spirit of the several councils in Germany which, in the 10th c., labored at the work of reformation. He died in 973.—See the ancient "*Vita S. Oudalrici Episcopi*," which is edited by Mabillon, by the Bollandists, and recently by Dr Pertz. Some letters and sermons, still extant, have been ascribed to U., but they are regarded as spurious by Mabillon and Pertz, as well as by the Bollandists.—See Braun's "*Geschichte der Bischöfe von Augsburg*."

ULRICI, Hermann, a German philosopher, born at Pforten in Lower Lusatia, 23d March 1806, studied at Halle and Berlin, and after a brief career as a lawyer, devoted himself exclusively to literature and philosophy. In 1834, he was appointed a professor-extraordinary at Halle, where he still occupies a chair. His first work was his "*Geschichte der Hellenischen Dichtkunst*" (1835), which was followed by a very ingenious essay on the dramatic art of Shakspeare ("*Ueber Shakspeare's dramatische Kunst*," 1839; Eng. transl., 1846). Other works of U.'s are his "*Ueber Princip und Methode der Hegel'schen Philosophie*" (1841); "*Das Grundprincip der Philosophie*" (1845-6); a "*System der Logik*" (1852); "*Gott und die Natur*" (1863; 2d ed. 1866), "*Gott und der Mensch*" (1866), in which U. develops a system of theistic philosophy, in opposition to materialism and anti-ethical pantheistic speculation. Further Shakspearian studies we have in "*Romeo und Julia*," and a "*Geschichte Shakspeare's und seiner Dichtung*" (1867).

ULSTER (Lat. *Ulltonia*), a province of Ireland, the most northern of the four provinces which compose that kingdom (see IRELAND), is divided into nine counties—Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone, each of which is described under its proper head.

The territorial distribution under which U. formed a province, or at least a distinct territory, is of very ancient origin. It formed one of the five ancient divisions of Ireland, and was the seat of the Hy-Nialls or O'Neills, as well as of the lesser septa of O'Donnell, O'Connell, O'Doherty, Maguire, MacMahon, &c. The north-eastern portion, now the county of Down, was early overrun by John d. Courcy, and subsequently by Hugh de Lacy, and was the most permanent seat of English power in the north. The Antrim coast was occupied by a Celtic colony, from Scotland and the Isles; but although various efforts were made by the English to effect a permanent settlement in the north and north-west, the success was but nominal until the reign of Elizabeth and James I., when the Plantation of U. was effected. Of this gigantic scheme of colonisation, the chief seat was the county of Londonderry, (q. v.). In U., the Celtic race, owing to the frequent and large infusions of a foreign element, is found in a much smaller proportion. In 1861, the Roman Catholics were slightly in excess of the total of all other denominations, the whole population being 1,910,105, and the Roman Catholics numbering 963,637. These proportions, owing to ten years' emigration, are reversed in the returns of 1871. Of the total population in 1871, 1,833,223, the Protestants of all denominations made up 935,998; the Roman Catholics, only 897,230. Of the former, the greater number, viz., 477,729, were Presbyterians, 393,263 belonged to the Episcopal Church, and the rest were Protestants of other denominations.

ULSTER BADGE. On the institution of the order of Baronets in England by James I. a sinister hand, erect, open, and couped at the wrist gules, the armorial ensign of the province of Ulster, was made their distinguishing badge, in respect of the order having been intended for the encouragement of plantations in the province of Ulster. This badge is sometimes borne in a canton, sometimes on an escutcheon, the latter placed either in the fess point or in the middle-chief point, so as to interfere as little as possible with the charges of the shield.

ULSTER KING-OF-ARMS. the king-of-arms or chief heraldic officer of Ireland. A king-of-arms called Ireland existed in the time of Richard II., but the office seems to have fallen into abeyance in the following century. Ulster was created to supply his place by letters-patent of Edward VI. in 1552. Ulster holds his appointment from the brown, and acts under the immediate direction of the Lord-lieutenant of Ireland. His office is in the Record Tower of Dublin Castle; and the professional staff under him consists of two heralds, four pursuivants, one registrar, and one clerk of records. The records of Ulster's office comprise pedigrees of the nobility and gentry of Ireland, certificates of their deaths and funerals, and grants of arms. The official arms of Ulster King-of-arms are: Argent, St George's cross gules, on a chief of the last a lion passant gardant between a harp and a portcullis or.

ULTIMATUM, in Diplomacy, the final conditions or terms offered by one government for the settlement of its disputes with another: the most favorable terms which a negotiator is prepared to offer, whose rejection will generally be considered to put an end to negotiation.

ULTIMUS HÆTRES, in the Law of Scotland, means the crown, which is the last heir after all the kins have become exhausted, and succeeds to the property of those who die without leaving next of kin, or who, being bastards, have no next of kin.

ULTRAMARINE, a beautiful blue pigment, formerly obtained only from the very valuable mineral, lapis-lazuli; but an artificial kind is now made so cheaply, and is so good, that it is generally used instead. The true ultramarine, from its costly nature, was only used by artists; the artificial sort is, however, extensively used by house and ship painters, and is as cheap as it is beautiful. Many artists still insist upon having the former kind, which is prepared as follows: Fine lapis-lazuli is broken up into very small pieces, so as to enable the operator to see and pick out the small white portions which occur in it. Of the pieces of pure blue which remain, a pound-weight is then taken, and in a carefully covered crucible, is heated to redness, and then thrown into cold water. It is next reduced to an impalpable powder, and mixed with six ounces of finely powdered resin, as light in color as it can be obtained, and two ounces each of spirits of turpentine, bees-wax, and linseed oil, all previously melted together. When these ingredients are thoroughly worked into a mass, portions of it are taken and kneaded in clean water; as long as any blue color is given out, this is continued, until every portion has been so treated. The blue water is then allowed to rest, and the sediment is collected and washed into water several times. The first washing removes a considerable quantity of dirt and other foreign matters, and is consequently rejected. The second, after being well agitated, is decanted; and from it is obtained the highest quality of the pigment. That which remains, usually has two other washings, each of which gives a product of a less value than the operation which preceded it. The product obtained by sediment from each of the waters used, is carefully dried, and is then employed either to make cakes for water-color painting, or a mixture for oil-painting, the value being about £1 per ounce. **ARTIFICIAL ULTRAMARINE.**—The French chemists Clement and Desormes, in studying the curious process of obtaining ultramarine from lapis-lazuli by mixing it with resin, &c., were led to an analysis of the coloring matter that suggested to Gmelin the idea of composing it artificially. In this he succeeded and obtained for his discovery the prize of 6000 francs offered by the *Société d'Encouragement des Arts*. Almost simultaneously, Gmelin in Tübingen gave an analysis and a synthetic process which also succeeded, and artificial ultramarine is now a regular article of manufacture. Chemical skill, however, is necessary to success, and the manufacturers' formulas are very various—differing in the quantities of the ingredients, and the order of mixing them. The German manufacturers are very successful, and some of them have recently produced a fine green ultramarine. The following formula is one of the simplest: 100 parts of finely washed kaolin or porcelain clay (silicate of alum-

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Ulysses

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ina), 100 of carbonate of soda, 60 of sulphur, and 12 of charcoal, are mixed and exposed in a covered crucible, to a bright heat for $3\frac{1}{2}$ hours, when a green, unfused residue should be left. This residue, after being well washed and dried, must be mixed with a fifth of its weight of sulphur, and exposed in a thin layer to a gentle heat, so as just to burn off the sulphur. When this is accomplished, more sulphur must be added, and the washing repeated; and so on, until the mass acquires a light blue color, which is usually the case after the third roasting. In 1812, however, Fürstenau introduced improvements into the manufacture of ultramarine, shewing how the blue tint could be produced in one calcination. There is reason to believe, from the experiments of Wilkens, that ultramarine is composed of two portions—one of which is constant in its composition, and is the essential coloring matter, containing about 40 of silicic acid, 26 of alumina, 13 of sulphur, and 21 of soda, arranged as a mixture of two silicates of alumina, sulphite of soda, and sulphide of sodium—the blue coloring principle being a compound of the latter two; while the other portion differs from the former in resisting the action of hydrochloric acid, and contains a variable amount of sand, clay, oxide of iron, and sulphuric acid. Ultramarine, if heated in the air, gradually assumes a dull green tint; and it is quickly decomposed by the action of the mineral acids and chlorine.

The term *Yellow Ultramarine* is sometimes given commercially to chromate of baryta, a yellow insoluble powder used as a pigment.

ULTRAMONTANE (Lat. beyond the mountains—the Alps—namely, in relation to France), that party in the Church of Rome which assigns the greatest weight to the papal prerogative. The pope, according to the U. doctrine, is superior to general councils, and independent of their decrees; he is considered to be the source of all jurisdiction in the church; and it is through him, and not directly in virtue of their episcopal office, that the bishops derive their powers of "jurisdiction," as distinguished from those of "order." See **ORDERS**. The U. school has been the opponent of those doctrines and views which favor the right of self-government by national churches. The school opposed to the U. is called the Gallican. See **GALLICAN CHURCH**.

ULUGH-BEG, the grandson of Timûr (q. v.), governed Western Turkestan as regent for his father Shah Rokh, while the latter was employed in regulating the affairs of the southern half of the empire, and succeeded, in 1447, to the imperial throne on his father's death. He was a successful warrior, as was of necessity every ruler of this period; but happening, unfortunately, to conceive suspicions of the loyalty of his eldest son, suspicions founded only upon astrological indications, the offended and injured prince rebelled, defeated and captured his father, and soon after caused him to be put to death, thus fulfilling the prediction, 1449 A. D.

U. is known to posterity as the founder of the observatory at Samarkand, as the liberal patron of astronomers, and as himself a most diligent observer. The astronomical tables which bear his name, in all probability compiled by himself and his two fellow-laborers, Salah-ed-din Cadizadeh al Roumi and Gaiathed-din Mohammed Jerushaid al Conshgi, enjoy a high reputation for accuracy, considering the time when they were compiled, and the means of observation in the hands of astronomers. The astronomical works of U. were written in Arabic, afterwards translated into Persian, and thence the chronological portion of them rendered into Latin (Lond. 1650), by Greaves, who followed with a Latin version of the geographical part in 1652. An independent version of the same work in Latin and Persian was published by Dr Thomas Hyde, at Oxford, in 1665. A new edition of U.'s catalogue of stars will be found in the "Memoirs of the Royal Astronomical Society," vol. xiii.

ULULATION (Lat. howling). It sometimes happens that articulate sounds or cries resembling, perhaps imitative of those of animals, or mere shrieking and howling, form the sole or chief symptom and characteristic of a morbid mental state. The act is automatic, and may be regarded as indicative of grave changes in the physical and moral nature. In the middle ages, during great religious excitement, and those mental epidemics which involved large communities, such phenomena appear to have been of frequent occurrence. It appears that in the 18th c. a

family of five sisters, in the county of Oxford, were affected with a modification of hysteria, during which they howled or barked like a dog; and that, about the same period, a large religious community of females in France, one and all, and at the same hours, shrieked or mewled like cats; and were only reduced to sobriety and to silence by the presence of military.—Laycock on "Nervous Diseases of Females," p. 286; Calmeil, "De la Folie considérée sous le point de Vue Pathologique, Philosophique, Historique, et Judiciaire," t. ii. p. 810.

UL'VA. See LAYER.

UL'VERSTON, a small but important market-town and seaport of Lancashire, in the district of Furness, 22 miles by railway north-west of Lancaster. It stands in an extensive agricultural and mining district, and is the centre of commerce for Furness and for parts of Cumberland and Westmoreland. It contains cotton and paper mills, and carries on manufactures of linen, ropes, and woollen yarn, and has a coasting-trade in iron and copper ores, limestones, grain, and gunpowder. Pop. (1871) 7607.

ULY'SSES, Ulyxes, and Ulixes, the Latin forms of the Greek ODYSSEUS, I. e., the "Angry," the name of one of the most celebrated heroes of the Trojan war. Different accounts are given of his parentage; but according to the oldest legend, the Homeric, he was the son of Laertes, Prince of Ithaca (one of the Ionian Isles), and of Anticleia, daughter of Antolycus. According to a later account, his father was the crafty Sisyphus; whence he is sometimes called, by way of reproach, Sisyphides. He married Penelope (q. v.), by whom he became the father of Telemachus. While still a youth, he acquired a reputation for courage, eloquence, and address. When the expedition against Troy was resolved on, Agamemnon visited Ithaca, and prevailed on U., though with difficulty, to take part in it. Later traditions, or, as in this case, perhaps we ought to call them *intentions*, go on to exaggerate the reluctance of U. to leave his home, and represent him as feigning madness—an artifice which did not, however, succeed. Before hostilities broke out, U., in conjunction with Menelaus and Palamedes, was sent to Troy, with the view of persuading the Trojans to give up Helen and her treasures; but this little bit of diplomacy having failed, the Greek princes assembled their fleets in the port of Aulis, and sailed for Troy, U. bringing with him twelve ships. During the siege, U. performed important services for the Greeks. In prudence, ingenuity of resource, and *finesse*, he was the foremost of the Hellenic chiefs, while in courage he was inferior to none. After the fall of Troy, the most interesting part of U.'s career begins, and forms the subject of the Homeric poem called the "Odyssey." Several of his adventures are manifestly of eastern origin, and closely resemble those of "Sinbad the Sailor." Setting sail for home, his ships were driven by a storm on the coast of Thrace, where he plundered the town of Ismarus, but lost a number of his crew. Having re-embarked, a north wind blew them across the Ægean and the Levant, to the country of the Lotophagi (the "Lotus-eaters"), on the coasts of Libya, where the companions of U. ate of the wondrous fruit, and wished to rest for ever. (Our readers will remember Tennyson's delicious rendering of this episode.) But their leader compelled them to leave the land "in which it alway seemeth afternoon;" and sailing north again, they touched at the "island of goats," where U. left all his ships but one. Thence he proceeded westward, till he reached the "island of the Cyclopes" (Sicily), where occurred the incident narrated under POLYPHEMUS (q. v.). The island of Æolus, and the city of the Læstrygonæ, (a race of cannibals), whither fortune and the winds next carried the Hellenic chief, are supposed to be only names for particular parts of Sicily. Thence he sailed westward to the island of Ææa, inhabited by the sorceress Circe (q. v.). After a year's sojourn, he departed, and sailing still further west, crossed Oceanus, the "ocean-stream," into the country of the Chimerians (q. v.), where darkness reigns perpetually. Here (following the advice of Circe) he descended into Hades (q. v.), and inquired at the blind seer Teiresias how he might get back to his native land. Teiresias disclosed to U. the fact of the implacable enmity of Poseidon (Neptune), on account of his having rendered Polyphemus (who was a son of Poseidon by the nymph Thoosa) blind, but encouraged him at the same time with the assurance that he would yet reach Ithaca in safety, if he would not meddle with the herds of Helios (the sun-god) in Thrinacia. U. now retraced his course, and once

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Uma

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more visited Circe, the kindly sorceress, who forewarned him of the dangers he would yet have to encounter, and how to act. A west wind blew them past the perilous island of the Sirens (q. v.) to the coasts of Italy. In passing between Scylla and Charybdis the monster that inhabited the first of these rocks devoured six of U.'s companions. He next came to Thrinacia, which he would fain have passed by, but his crew insisted on landing, and in spite of their oath, killed some of the cattle of Helios while U. was asleep. The anger of Zeus was kindled. When they had sailed away, a fierce storm arose, and Zeus sent forth a flash of lightning that destroyed the ship. Every one on board was drowned except U. himself, who, after many dangers, reached the island of Ogygia, the abode of the nymph Calypso, with whom he lived for eight years. After his departure (which was commanded by Zeus, who had promised to Athene that U. should one day see Ithaca again—the poet always represents him as having a longing after his native Isle), Poseidon persecuted him with a storm, and cast him on the shores of Scheria, the island of the Phæacians, in a very forlorn and indescribable condition. He was, however, very kindly received by Nausicaa, daughter of King Alcinoüs; and having revealed his name at a feast, the monarch provided him with a ship to carry him home. U. was asleep when the vessel approached the coast of Ithaca; and the Phæacian sailors who had accompanied him bore the unconscious hero to the shore, and left him there. When he awoke, he did not at first recognise where he was; but Athene appearing, informed him, and of all that had happened to Penelope (q. v.) in his absence. Disguised as a beggar, he repaired to his own court, where he was recognised by his nurse, and, as Homer touchingly describes, by his old dog Argus. Aided by Telemachus, and the swine-herd Eumæus, he took vengeance upon the insolent suitors of his wife, all of whom, without exception, he slew. Homer records nothing more of U.'s history; but he makes Teiresias prophesy, in the 11th book, that the hero would meet a painless death in a happy old age. Another tradition says that he was slain by Telegonus, his son by Circe. Later poets, e. g., Virgil and Ovid, represent U. as a much less noble and valiant character than he appears in Homer; his wisdom and subtlety are changed into cunning and deceit; and instead of heroic courage, he displays the spirit of a coward.

UM is a Kafir or Zulu word signifying river, and is used as prefix in the names of most of the rivers on the south-east coast of Africa, from the Great Kei, where the names of Hottentot origin appear to cease, as far to the north-east nearly as the Sofala coast, where the names Imhambane, Imhampoor, have the same prefix in a corrupted shape. Amongst the principal rivers on this coast bearing this prefix may be mentioned the Umgazi, Unbashee, Umtata, Umzimvoobo, and Umzimvula, draining Independent Kaffraria; the Umcomauzi and Umrugela, in the colony of Natal; and the Umfolusi, Umhlatoozi, and Umapoota, between Natal and Delagoa Bay. The Hottentot word Kei has the same meaning, and is still preserved in the Kei and Kelskamunna rivers, the Keriega, Kelsnga, and other streams on the east-coast of the Cape Colony.

UMĀ is, in the epic and Purāṇic mythology of India (see *Religion*, under INDIA) one of the principal names of the consort of the god Śiva. Other names by which she is also usually designated are *Durgā*, *Devī*, *Kālī*, *Pārvatī*, *Bhavānī*, while there are many more belonging to her which are of less frequent occurrence, as *Kātyāyanī*, *Ambika*, *Haimavathī*, *Siva*, &c. As Śiva is not yet a deity of the Vedic period of India, such of these names as are met with in Vedic writings have there a different import from that assigned to them by the latter mythology. Thus, *Ambika* is, in the Yajurveda, a sister of *Rudra* (q. v.); *Kālī*, a word which occurs in the *Mund'aka Upanishad* (q. v.), is there the name of one of the seven flickering tongues of Agni, the god of fire; *Durgā*, in a hymn of the Taittiriya Āraṇ'yaka, is an epithet of the sacrificed flame; and *Umā*, when mentioned in one recension of the same Āraṇ'yaka (see VEDA and UPINSHAD), and in the Kena Upanishad, means the Brahma-science, or the knowledge of what is the nature of Brahman, the Supreme Soul; and in this sense she is identified in the Taittiriya Āraṇ'yaka with *Ambikā*. But since Rudra is in later mythology a name of Śiva, and the Vedic Rudra is a form of Agni, the fire, more especially of the fire of the sun; and since Umā, in the Kena Upanishad probably designates the power

of *Sūrya*, the sun, it becomes intelligible that *S'iva* (q. v.), who, at a later period of Hindu religion, is both the type of destruction and contemplation, had then associated with him deities which originally represented the energy of the fire and the power or wisdom of the sun, and that those deities were afterwards held to be merely different forms or names of one and the same deity, viz., his female energy (see *S'ĀKTAS*), or wife. Though this double character of the consort of *S'iva* is not always discernible in the myths which are connected with special designations of hers, and though at a late period the popular creed looked upon her far more as the type of destruction than as that of divine wisdom, yet the works devoted to her praise never fail to extol her also as the personification of the highest knowledge. Thus, in the "*Devīmāhātmya*," the Rishi *Mārkan'd'eya*, in reply to a question of King *Suratha*, says: "By *Devī*, this whole universe, with what is movable and immovable, has been created, and, when propitious, she who bestows blessings leads men to their eternal bliss; for she, the eternal goddess, is the highest wisdom, the cause of eternal bliss, and also the cause of bondage for this world; she, who lords over the Lord of the universe." And in another passage of the same work, she is invoked thus: "O *Devī*, thou art the seed of the universe, the highest *Māyā* (q. v.); all this world is bewildered, but, descending on earth, thou art the cause of its final liberation: all the sciences are merely different modes of thyself." Similarly, also, in the "*Mahābhārata*" (q. v.), *Arjuna* says to her: "Of sciences thou art the *Brahma-science*," &c.; and in the "*Harivans'a*," *Vishn'u* addresses her as *Sarasvatī*, the goddess of eloquence, as *Smriti*, tradition, and, of sciences, as the *Brahma-science*, &c.

The myths relating to this goddess, who is worshipped in various parts of India—particularly, however, in Bengal (see *S'ĀKTAS*)—are met with in the great epic poems and *Purāṇas*, in poetical works, such as the "*Kumārasambhava*" (see *KĀLIDĀSA*), and in modern popular compositions; but the text-book of her worshippers is the "*Devīmāhātmya*," or "the majesty of *Devī*"—a celebrated portion of the "*Mārkan'd'eya Purāṇa*," and considered to be of especial holiness by the worshippers of this goddess. In the "*Rāmāyan'a*" (q. v.), she is spoken of as the daughter of Mount *Himālaya* (her names *Pārvatī*, *Haimavatī*, *Aditjā*, *Girijā*, and similar ones, mean "the mountainous or the mountain-born"), and of the nymph *Menā*, whose elder daughter, however, was the *Ganges*. According to the *Vishn'u*-and other *Purāṇas*, she was in a former life *Sati*, the daughter of *Dakṣa*, who abandoned her corporeal existence in consequence of having been slighted by her father when he performed a great sacrifice, and did not invite *S'iva* to share in it; but it was only as *Umā* that she bore children to her husband, viz., *Ganes'a*, the god of wisdom, and *Kārtikeya* (q. v.), the god of war. According to the *Harivans'a*, she was, in another life, born as the daughter of *Yas'odā*, and exchanged for *Vishn'u* when in his incarnation as *Kṛ'tsn'a*, he was born as a son of *Devak*. See *Vi-ṣṇ'u*. On that occasion, she was killed by *Kansa* (q. v.); but as soon as he had dashed her to the ground, she rose to the sky, leaving behind her corporeal frame, and became a divine virgin, to whom the gods addressed their praises. Hence her names, *Kanyā*, *Kumārī*, &c., the virgin. This connection between the legendary history of *Umā* and *Vishn'u* is also briefly referred to in the "*Devīmāhātmya*," though this work is chiefly concerned in the narrative of the martial feats of the goddess. The latter consisted in the destruction by her of two demons, *Madhu* and *Kait'abha* who had endangered the existence of the god *Brahman*; and of the demon *Mahisha* or *Mahishāsura*, who, having conquered all the gods, had expelled them from heaven, and who met *Devī*, assisted only by her lion, with a numberless host of demons; moreover, in her defeating the army of *Chan'd'a* and *Mun'd'a*, two demon-servants of *S'umbha* and *Nis'umbha*; in her killing the demon *Raktasīja*, who had a sort of charmed life, each drop of his blood, when shed, producing hundreds of demons like himself; and ultimately, in her destroying the demons *S'umbha* and *Nis'umbha* themselves. In commemoration of her victory over *Mahishāsura*, a festival called the *Durgāpūjā*, or *Durgotsava*, is annually celebrated in Bengal. "The goddess," the Rev. Mr. Banerjee relates in his introduction to the *Mārkan'd'eya Purāṇa*, "is there represented with ten arms, trampling upon the demon, who is also attacked by her lion, and wounded in the chest by her spear. She has also laid hold of him by the hair, and is about to chop off his head. The most popular commemoration of this event takes place in the autumn, about the time of the equinox; and if she practice may be supposed to be

Uman
Umbilical

800 or 1000 years old, it is not inconceivable that it was originally fixed at the equinox, though the precession has since made it a few days later. The calculation of the day depends, however, on a certain lunar day; but it can never be earlier than the seventh of As'win, which is about the time of our present equinox; nor can it be more than a month later than that date. The idea of the possible connection of the *Durgapūjā* with the equinox, is suggested by the fact, that there is a corresponding festival about the time of the vernal equinox too, in which, though it is not so popular as the autumnal *pūjā*, the same group of figures is constructed, and the image of the goddess is in the same attitude, with the same attendance, and the same enemy." (For a somewhat more detailed account of this festival, see Moor's "Hindu Pantheon," p. 156.) Three weeks after the *Durgapūjā*, another festival in honor of this goddess, called the *Kalpīpūjā*, takes place, to commemorate her victory over *Chan'd'a* and *Mun'd'a*. "The sable goddess," Mr Banerjea says, "is represented holding the severed head of Chan'd'a in her hand, with the heads of his soldiers formed into a garland suspended from her neck and their hands wreathed into a covering round her loins—the only covering she has in the image constructed for the *pūjā*. The worship of *Kālī* (i. e., the Black), to which the narrative (of her victory over Chan'd'a and Mun'd'a) has given rise, is considered by the Hindus themselves as embodying the principle of *tamas*, or darkness. She is represented as delighting in the slaughter of her foes, though capable of kinder feelings to her friends. She is, however, styled the Black Goddess of Terror, frequenting cemeteries, and presiding over terrible sprites, fond of bloody sacrifices; and her worship taking place in the darkest night of the month." (For this worship, see also the article THUG.) With S'iva, she resides on Mount *Kailāsa*, the northern peak of the *Himālaya*, or in her own palace on the *Vindhya* mountain, where she amuses herself with hunting. Her representations are numerous and various. Sometimes she is seen riding on a bull, with a trident in her hand, a serpent as a bracelet, and a half-moon on her forehead; sometimes, when in the act of fighting *Mahishāsura*, she rides on her lion (*Manasīlīn*), the latter standing between the frontal bones of her elephant. Or, as *Bhadra-Kālī*, she is represented "eight-handed, two of her hands being empty, pointing upward and downward, one of her right hands holding something like a caduceus, its corresponding left hand, a cup; the next right and left hands, a crooked sword, and a shield with an embossed flower or fruit; the superior right hand, an agricultural implement; and the left, the noose to strangle victims with [see THUG]. Her person is richly dressed and ornamented; between her full breasts, a five-headed serpent uprears itself; she has a necklace of human heads; her ear-drops are elephants; and a row of snake-heads peeps over her coronet. Her forehead is marked either with S'iva's third eye, or her own symbol; and her open mouth shows her teeth and tusks, giving her a fierce and threatening aspect." See Moor's "Hindu Pantheon," where, besides, other descriptions of images of this goddess are given. —For the myths relating to her, see John Muir's excellent work, the "Original Sanskrit Texts," vol. iv. (Lond. 1863); the "Harivansa," translated by A. Langlois (Paris, 1884—1885); and the "Mārkan'd'eya Purān'a," in the "Bibliotheca Indica," edited, with an elaborate Preface, by the Rev. K. M. Banerjea (Calcutta, 1862).

UMA'N. a town of Russia, in the government of Kiev, 120 miles south of the town of Kiev, on the Umanka. It is enclosed by earthen ramparts. Pop. (1867) 14,791.

UMBA'LLA, or Amba'la, a walled town of India, in a division of the same name in the Punjab, 120 miles n.n.w. of Delhi. Under the walls of the fort are the British cantonments. Pop. (1868) of city, 24,040; of cantonments, 16,622; of division, 1,652,728. .

UMBEL. See UMBELLIFERÆ.

UMBELLIFERÆ (*Apiaceæ* of Lindley), a large and important natural order of exogenous plants, containing more than 1000 species, abounding chiefly in the temperate regions of the northern hemisphere. A peculiar regularity distinguishes the inflorescence of most of this order; a number of stalks, radiating from a common centre at the top of the stem, or of a branch, each of which bears a flower at its extremity, thus forming what is called an *umbel*. The umbel is often compound, the primary stalks dividing in a radiated manner, and forming *secondary umbels* or *um-*

bellules. The flowers are generally small, although the umbel which they compose is often large. They are generally white, rarely yellow, still more rarely red, though frequently tinged with pink at the edges; have a 5-toothed calyx, often obsolete or nearly so; a corolla of five petals, inserted in the top of the calyx, and alternating with its teeth, five stamens, an inferior germen, and two styles. The fruit is very peculiar, and consists of two one-seeded, unopening carpels, rarely fleshy, touching one another on the inner side, and there attached to a little column (the *carpopophore*), their common axis. Each carpel has five primary and four secondary longitudinal ridges, more or less distinct; and beneath the separating furrows there are often linear receptacles of essential oil, called *vitæ*. The U. are mostly herbaceous plants, rarely shrubby. They generally have divided or compound, rarely simple leaves. They generally abound in a resinous secretion, and a volatile oil, from which many of them derive poisonous and medicinal properties, which are more or less common to all parts of the plant, and often highly developed in the seeds. Acridity is their general characteristic. Some are pleasantly aromatic, others have a powerful and disagreeable smell. In the roots of some, especially when enlarged by cultivation, starch and sugar are secreted, so that they become useful for food, although the peculiar flavor of the essential oil is still retained. The systematic arrangement of the U. has been found difficult by botanists. Sprengel, De Candolle, Koch, and others, have devoted much attention to this order. Of esculent-rooted U., the carrot and parsnip are the best known examples. Skirret, carib-pnut, and arracacha are also of some value. The roots of *Anesorhiza Capensis* and *Faniculum Capense* are used as esculents at the Cape of Good Hope. The roots of *Charophyllum tuberosum*, or SHAM, are used in the Himalaya. The herbage of *Frangos pabularia* is so bland that it is much used in the temperate parts of the East Indies for feeding cattle, and made into hay for winter fodder. It is said, however, to be injurious to horses, although oxen and sheep are rapidly fattened by it. The blanched stems of celery, enlarged by cultivation, are a favorable salad, and those of Alexanders (*Smyrnum olusatrum*) were formerly used in the same way. The caudex stalks of eryngo were once much esteemed, and those of angelica are still used. The leaves of parsley, chervil, fenail, &c., are used for flavoring. Lovage (*Levisticum officinale*) is sometimes cultivated as a salad plant. The seeds of anise, caraway, coriander, &c., are used as carminatives. Hemlock, water hemlock, water parsnip, fool's parsley, and many others, are narcotic poisons—asafoetida, galbanum, sagapenum, and opoponax are medicinal products of this order.

UMBER (*Scopus umbretta*), an African bird of the family *Ardeidae*, allied to the storks, but having a compressed bill with sharp ridge, the tip of the upper mandible hooked, and the nostrils situated in a furrow which extends all the length of the bill. It is about the size of a crow, with umber-colored plumage, and the male has a large crest on the back of the head.

UMBER, a mineral used as a pigment, a variety of the iron ore called *Hæmatite* (q. v.), and consisting chiefly of oxide of iron, with some oxide of manganese, silica, alumina, and water. It is soft and earthy, of a dark brown color, and has a conchoidal fracture. It readily imbibes water, and falls to pieces, like newly-burnt lime. It is found in Cyprus in beds. When roasted, it becomes reddish brown in color, and in that state is also used as an artist's color.

UMBILICAL CORD, or Navel String, the bond of communication between the fœtus (which it enters at the umbilicus, or navel) and the placenta, which is attached to the inner surface of the maternal womb. It consists of the umbilical vein lying in the centre, and the two umbilical arteries winding from left to right round the vein. Contrary to the usual course, the vein conveys arterial blood to the fœtus, and the arteries return venous blood to the placenta. These vessels are embedded in a yellow gelatinous matter, known from its first describer (in 1659) as Wharton's gelatine. Nervous filaments have been traced into the cord; but the presence of lymphatics is doubtful. The whole is invested by a membrane (the amnion), and its ordinary length is about 20 inches. As soon as a child is born, and its respiration fairly established, the umbilical cord is tied, and divided near the navel, which spontaneously closes, the fragment of attached cord dying away. See the articles **Fœtus** and **PLACENTA**.

Umbilical
Uncleanliness

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UMBILICAL CORD, in Botany, the connecting link between the placenta of the ovary and the ovule, through which pass the vessels which nourish the ovule till it ripens into the seed. In some plants, the ovules are so closely connected with the placenta, that no umbilical cord can be said to exist; in others, it is of considerable length.

UMBILICAL HERNIA is the term applied to the protrusion of intestine at the navel or umbilicus. It is, for obvious anatomical reasons, of most frequent occurrence shortly after birth; but it is not common in women who have been frequently pregnant. If the hernia is reducible, and the patient an infant, the ordinary course of treatment is, after returning the parts to their proper position, to place the convex surface of an ivory hemisphere on the navel, and to retain it there either with strips of adhesive plaster, or with a bandage. Special trusses are made for the treatment of this affection in adults. In cases of irreducible hernia, a large hollow pad should be worn. If it becomes strangulated, an operation may become necessary.

UMBILICUS is the anatomical term for the navel.

UMBRELLA (Lat. *umbra*, a shade). As a shade from the sun, the umbrella is of great antiquity. In the sculptures of Egypt, Nineveh, and Persæpolis, umbrellas are frequently figured, closely resembling the chaise umbrella of the present day. In the East, however, its use seems to have been confined to royalty; but in Greece and Rome it was more extensive. The custom was probably continued in Italy from ancient times; but at the beginning of the 17th c. the invention seems to have been little if at all known in England. In that century, however, it came into use as a luxurious sun-shade; and in the reign of Queen Anne it had become common in London as a screen from the rain, but only for the weaker sex. The first person of the male sex who had the moral courage to carry an umbrella in the streets of London was Jonas Hanway, the founder of the Magdalene Hospital, who was newly returned from Persia, and in delicate health. Still, it was long regarded as a sign of infirmity or effeminacy to use them, and those who did so suffered much unpleasant jeering in consequence. They were at first all brought from abroad, chiefly from India, Spain, and France; now the manufacture of umbrellas has reached an enormous extent in Great Britain—the exports alone amounting to the value of £200,000; whilst, instead of effeminacy, it is considered now a sign of poverty or improvidence not to be possessed of one.

UMBRIA, one of the ancient divisions of Italy, west of Etruria, and north of the country of the Sabines. It is usually described as extending from the Tiber eastward to the Adriatic; but while this was probably the case in pre-historic times, it was not so during any part of the period of which we have authentic knowledge. Tradition, indeed, leads us to believe that at one time the Umbrian territory extended from sea to sea, embracing much, if not the whole, of the country subsequently occupied by the Etruscans; but when the Umbrians first came before us as a distinct people, we find them restricted to the ridges of the Apennines, the lowland region bordering on the Adriatic from the *Æsis* (mod. *Esino*) to the *Itabicon*, being held by a race of Gallic invaders, known as the Senones. The most notable towns of U. were Narnia, Interamna, Ariminum, Spoletium, Mevania, Fulginium, Assisium, Tifernum, Nuceria, Camerinum, Sentium, Urbinum, Sena Gallica, Fanum, Forum, and Ariminum.

The Umbrians were considered in ancient times to be the oldest people of Italy, and were, in consequence, vaguely spoken of as "aborigines;" but neither the knowledge of the ancients, nor the methods of investigation which they pursued, allowed them to arrive at any trustworthy ethnological results. Modern researches into their language (of which we possess one important memorial in the tables of Iguvium; see *EVGUBINE TABLES*) have demonstrated that they spoke a tongue closely allied to the Oscan (see *OSCI*), and were therefore, in all probability, members of the Latino-Italian race. These researches further tend to confirm the tradition of their great antiquity, for an analysis of the structure of the Umbrian language proves it to be the oldest of the Italian dialects.

The Umbrians make their first authentic appearance in the wars between the Romans and the Etruscans. They would seem to have been destitute of any political organisation or unity, for we find that some of their tribes took part with the Ro-

mans, and others—probably the majority—with the Etruscans. At anyrate, they were subjugated along with the latter people; and we do not read of them again until the third Samnite war, when, in conjunction with the Etruscans and Gauls, they joined the Samnites in their last gallant struggle against the imperious supremacy of Rome (q. v.). The confederacy was utterly vanquished in the great battle of Sentinum (295 B.C.), and the Umbrians were again reduced to submission. The establishment of Roman colonies in the *Gallia Ager*, or territory of the Senonian Gauls, seems to have completely overawed, and gradually even to have Romanised them. They stood faithfully by Rome in the dark years of the Hannibalic war, and were among the first to furnish Scipio with volunteers for the invasion of Africa. In 90 B.C., they obtained the Roman franchise, and thenceforth disappear from history as a distinct people.

UMPIRE is a third arbitrator appointed by two arbitrators in the event of their differing in opinion; and when the reference or arbitration has devolved upon the umpire, his award or umpirage becomes final and binding on the parties.

UMRO'HAH, a town of British India, in the district of Moradabad, N. W. Provinces, 80 miles east-north-east of Delhi. Pop. (1871) 82,814.

UNALA'SHKA, an island in the North Pacific, belongs to the Fox group of the Aleutian Islands, in lat. 55° 52' N., and 166° 32' W. It is 75 miles long, and in some parts 20 miles broad, has a rugged mountainous surface, and is thinly peopled. Ships are here supplied with all necessaries except wood.

UNCA'RIA. See GAMBIE.

UNCIAL LETTERS—so called as being an inch (Lat. *uncia*) long—characters of a large and round form, used in some ancient MSS. The earliest form of an alphabet is its capitals, and the oldest Greek and Latin MSS. are written entirely in capitals. Uncial letters, which began to take the place of capitals in the middle of the 5th c., differ from them in being composed of rounded, and not straight lines, and exhibiting a tendency towards greater expedition in style. Uncial writing arose as writing on papyrus or vellum became common, the necessity for more rapid execution leading to the practice of curving the lines. Its being more easily learned than the cursive style, was probably the cause of its becoming the favorite mode of writing books of importance among the monkish scribes; while legal instruments, which required greater dispatch, were executed by professional scribes in a corrupted form of the Roman cursive hand. Uncial writing prevailed from the 6th to 8th, or even 10th century.

During the 6th and 7th centuries, a transitional style of writing prevailed in Italy, and to some extent elsewhere, in which the letters approximated more nearly to the Roman cursive hand; this passed by a gradual transition into the *minuscule* manner, or small hand, which, from the beginning of the 10th c., became usual in MSS. —See Silvestre's "Universal Palæography," translated and edited by Sir F. Madden (Lond. 1860); "Traité de Diplomatique," par deux Religieux Benedictins de la Congrégation de St Maur" (Par. 1755).

UNCLEANNESS, in the Old Testament, betokens a state of bodily infirmity which, for the time being, excluded the sufferer from the "holy community," and which, by the various ceremonies connected with the gradual recovery from this exceptional state, went far to impress the people with the constantly reiterated connection between them and God, and their own destination of being "a holy people." No less did the strict cleanliness enforced by the constant fear of becoming an "outcast" for however brief a period, and the strict supervision exercised by the priests, to whom the sanitary well-being was to a certain extent intrusted, act in a salutary manner. Birth, death, the different sexual functions and infirmities, were all, in different manner, causes of uncleanness, and treated according to their different degrees. To a certain extent, some incongruous admixtures of plants, animals, even materials in one garment, &c., may also be reckoned among things that "defiled" or gave rise to a certain uncleanness. Fruits of a tree during its first three years were not to be eaten, as "uncircumcised" or unclean. About the special ways in which uncleanness was treated, we have spoken under PURIFICATION, where also the similarity that has been found between the Jewish laws on these points and those of the Persians and Indians, is touched upon. The uncleanness of the leper is specially treated under LEPROSY.

UNCONFORMABLE STRATA are strata which rests on the more or less inclined edges of older beds. The existence of unconformability in a series of strata is an indication of an interval sufficiently long to permit of the consolidation, disturbance, and upheaval, denudation, and subsequent depressing of the inferior beds. No indication of the period that has intervened is to be found in the unconformability itself; but some idea of it may be obtained by an examination of the strata that are known to have been deposited subsequent to the inferior rocks, and previous to the overlying unconformable deposits. Thus, in the north of Annandale, the Silurian basement rocks, which have often an almost perpendicular dip, are covered by Permian sandstone, and this, again, by the boulder-clay, or alluvial deposits. The first break in the strata represents the time during which the Devonian and Carboniferous rocks were deposited, when, in all probability, the Silurian strata formed a dry land surface, and supplied some of the materials for these rocks. The second break is all the indication in that district of the lengthened period during which the whole of the Secondary and Tertiary strata were being deposited elsewhere. The temporal value of the break is not so easily determined, in the majority of cases. It is only in one place in Britain, in a cutting in the St Helen's Railway near Ormskirk, where any apparent unconformability exists between the Bunter and Keuper strata, and even there it is so slight that it was long overlooked; yet this break represents a gap which on the continent is filled by the important sets of strata, the Muschelkalk and St Cassian beds, containing two great assemblages of fossils perfectly distinct from each other. Very frequently, however, no beds are known which fill up the gap between the two unconformable series. Professor Ramsay has shewn that in the Palæozoic epoch between the Laurentian gneiss and the Permian beds there are ten breaks. Each of these is accompanied by a sudden and remarkable change of fossils, sometimes in the genera, and always in the species. Professor Ramsay believes these gaps represent a *much greater* interval of time than that to which all the existing Palæozoic formations of Great Britain bear witness. Such blanks in the stony records of the world's history are as frequent in the Secondary and Tertiary epochs as in the Palæozoic.

The not taking into account the existence of unconformable stratification, has frequently caused a useless expenditure of money in searching for minerals. It seemed natural to expect that the Permian rocks of Upper Annandale covered beds of the true Coal-measures, but an examination of the numerous natural sections where the base of the Permian sandstone is seen, shews that it rests on the Silurian rocks; and the necessarily abortive attempts that have been made to reach coal through the Red Sandstone have been simply a useless throwing away of money.

UNCTION (Lat. *unctio*, an anointing, from *ungō*, I anoint), the practice of anointing the body, or certain portions of the body, with oil, especially with the oil of olives. It was resorted to by the ancients from motives of health (see **ONIA**), of athletic development, or of luxury; but the practice is noticeable here chiefly in its relations to religion. Anointing with oil seems to have been supposed to carry with it the same effects in spiritual things which it produces in the natural world. It was a rite in frequent use among the Egyptians, as well as the Greeks and Romans; and the Scriptural narrative of the ante-Mosaic religion contains distinct evidence of its use (Gen. xxviii. 13, xxxi. 13). In the Mosaic ceremonial, its use is still more frequent. Priests and kings were anointed on being set apart for their several offices; as were also sacred vessels. The oil employed in these religious unctions was prepared of the most precious perfumes and balsams, and Ezekiel rebukes the Jews (xxiii. 41) for making a similar unguent for their personal uses. The special significance of the rite of unction may be inferred from the circumstance that the popular name of the expected Messiah was the Christos, i. e., the Anointed. In Christian use, anointing from a very early time possessed the same sacred significance. See **EXTREME UNCTION**. Besides the anointing of the sick, however, there are many other sacred unctions traceable in ancient Christian practice; namely, in baptism, in confirmation, in the ordination of priests and other clergy, in the consecration of churches and altars, the benediction of sacred vessels and utensils, &c. It has also been employed in the coronation of kings; and in some countries, curious traditions and legends are preserved connected with the unction of the king, or arising out of it. See **RHEIMS**.

UNDERGRADUATE, a student of a university or college who has not yet taken his first degree.

UNDINES (perhaps from *unda*, a wave), the name given in the fanciful system of the Paracelsists to the elementary spirits of the water. They are of the female sex. Among all the different orders of elementary spirits, they intermarry most readily with human beings, and the Undine who gives birth to a child under such a union, receives with her babe a human soul. But the man who takes an Undine to wife must be careful not to go on the water with her, or at least not to anger her while there, for in that case she will return to her original element. Should this happen, the Undine is not disposed to consider her marriage dissolved; she will rather seek to destroy her husband, should he venture on a second marriage. Baron de la Motte Fouqué has made this Paracelsist fancy the basis of an exquisite tale, entitled "Undine."

UNDULATORY THEORY OF LIGHT. Optics ranks next to Dynamics in the category of nearly *exact* sciences—that is, of sciences whose fundamental principles are so well known, that the result of almost any new experimental combination can be predicted mathematically. Given the forces acting on a body, the Laws of Motion (q. v.) enable us, by purely mathematical processes, to determine the consequent motion. Though we have not as yet arrived at equal perfection in Optics, we are certainly far on the way, and probably have now attained nearly all the progress (independent of improvements in our mathematical methods) which will be made until the next great step in molecular physics shall give us the clue to the nature of the minute motions on which Light, Heat, Electric Currents, and Magnetism depend. The most extraordinary and almost incredible predictions of theory have been verified by experiment, and at present the differences between theory and experiment may be divided into two classes, corresponding to the above exceptions. The first are those depending on the imperfections of mathematical processes, where, because, for example, as we are yet unable to obtain the exact solution of a certain differential equation, we have to content ourselves with an approximate one. But every improvement in our means of approximation is found to introduce a closer agreement between theory and experiment. This difficulty may safely be left to mathematicians. It is otherwise with the second difficulty. This depends on our ignorance of the ultimate nature of matter, and our consequent inability to apply mathematical reasoning in a perfectly correct and sufficiently comprehensive manner. Here the experimenter's work is still required, and it is in this direction that we must in all probability now look for important extensions of our knowledge.

Optics is divided into two parts, *Physical* and *Geometrical*. Of these, the latter contents itself with assuming certain obvious experimental truths, such as the fact, that light in a uniform medium moves in straight lines, the ordinary laws of reflection and refraction, &c., and, making these its basis, employs mathematics to develop their further consequences. It is thus that theory has shewn how to carry to their utmost perfection such exquisite specimens of art as the best telescopes and microscopes of the present day. But these investigations, and their practical application, are wholly independent of the *nature* of light, and cannot be affected by discoveries in that direction.

It is otherwise when we come to *Physical Optics*. This commences with the question: "*What is light?*" and endeavors to deduce from the nature of light the experimental laws which, as we have seen, are assumed as the basis of *Geometrical Optics*.

By two perfectly distinct classes of astronomical observations—Aberration (q. v.), and the Eclipses of Jupiter's satellites—we know that light takes *time* to pass from one body to another—the velocity, however, being enormous—about 200,000 miles per second. Hence it follows, that either *Matter* (q. v.) or *Energy* (see *FORCE*) must be transferred from a body to the eye before we can see it. Here we have at once the rival physical theories of light, which have alternately had the advantage of one another in explaining observed phenomena. It is only of late years that an *experimentum crucis* has finally decided between them—by shewing one of them to be utterly incompatible with a result of observation.

Newton adopted the corpuscular theory, in which light is supposed to consist of material particles—i. e., he adopted the first of the two possible hypotheses; and he gave the first instance of the solution of a problem involving molecular forces, by deducing from this theory the laws of reflection and single refraction. We shall see immediately that this beautiful investigation led to the destruction of the theory from which it was deduced. But, independent of this, there are many grave and obvious objections to the corpuscular theory; for it involves essentially the supposition of material particles impinging on the eye with the astounding velocity of 200,000 miles per second! If such particles weighed but the millionth of a pound, each would have something like ten times the Momentum (q. v.), (i. e., the battering power), and *six million* times the Vis-viva (q. v.), or kinetic energy (i. e., the penetrating power), of a rifle-bullet. Suppose them a million times smaller—yet as millions of millions of them must be supposed to enter the eye at once, coming from every point of the surface of every visible object, it seems impossible to reconcile such a hypothesis with the excessive delicacy of the organs of vision.

It is not pretended by the advocates of the rival hypothesis, the Undulatory Theory of Light, that they understand exactly the nature of the transference of energy on which they suppose light to depend; but they take from the analogy of sound in air, and of waves in water, the idea of the existence in all space of a highly elastic fluid (or quasi-solid), provisionally named the *Ether* (q. v.), and they suppose light to consist in the propagation of waves in this fluid. Huyghens has the credit of having propounded, and ably developed and illustrated, this theory.

As we have seen above, no third hypothesis as to the nature of light is admissible. Many strong arguments against the truth of the corpuscular theory had been furnished by experiment, especially in the early part of the present century; and as they were always met by further and more extraordinary properties which had to be attributed to the luminous corpuscles, the theory had become complicated in the most fearful manner; and this of itself was an almost complete disproof. Still, it held its ground, for Newton's old objection to the rival theory, viz., that, on the undulatory hypothesis there should be no shadows at all (witnoss the analogy of sounds heard round a corner), was as yet unanswered. This difficulty was overcome by Young (q. v.), to whose sagacity we are indebted for the idea of *Interference* (q. v.), which completely explained the apparent discrepancy. But the question between the rival theories was finally settled by Fizeau and Foucault, who, by processes entirely different, but agreeing in their results, determined the velocity of light in air and in water.

Now, Newton had shewn that refraction, such as that of light by water, if predicated of moving *particles*, requires that they should move faster in water than in air. Huyghens, again, had shewn, that if such refraction be predicated of *waves*, they must move slower in water than in air. Fizeau and Foucault found, by direct measurement, that light moves slower in water than in air. Hence it is certain that *light consists in the transference of energy, not of matter*; and the Undulatory Theory is based upon this fact.

But, as to the manner in which energy is thus transferred, we are entirely ignorant. The common assumption is, that waves of distortion are propagated in the ether. The nature of this motion will be described under *Wave*. But many other modes have been suggested, one of the most notable of which is that of Rankine. Here the particles of ether are not supposed to be *displaced*, but each is merely made to turn about an axis as the wave of light passes it; the particles having *Polarity* (q. v.), by virtue of which they arrange themselves in similar positions when no light is passing, and by which, also, any rotation of one particle produces a consequent rotation of those in its neighborhood. For the explanation of most of the common phenomena of optics, it is quite indifferent which of these assumptions we make, and, indeed, theory has not yet been carried far enough to enable us to devise experimental methods of testing which is the more likely to be the case in nature. It cannot be too strongly insisted on that all we know at present is, that light certainly depends on the transference of energy from one part of the luminiferous medium to another; what kind of energy is transferred, vibratory or oscillatory motion, or rotation, &c., is a problem which may possibly for ever remain unsolved. But vibratory wave-motion being that with which we are most familiar, as in earthquakes, sound, waves in water, &c., we naturally choose this as the most easily in-

telligible basis of explanation and illustration. And we shall now briefly shew how the laws of linear propagation, reflection, single refraction, interference, diffraction, dispersion, polarisation, and double refraction may be accounted for.

We assume, then, that light consists in a succession of waves, and for our earlier inquiries it does not matter whether they be (like those of sound) waves of condensation and rarefaction, in which the vibrations take place in the direction of the ray, or (like those in water) waves of distortion or displacement without condensation, in which case the luminous vibrations must be assumed to take place in some direction *perpendicular* to the ray. The phenomena of polarisation and double refraction shew us that the former of these hypothesis is untenable.

Propagation of Light in a Uniform Isotropic Medium. (An isotropic medium is such that if a cubical portion be taken, it possesses precisely the same properties whatever be the directions of its sides. Glass and water are isotropic, rock salt and ice are not.)—Suppose AB (fig. 1) to represent at any time the *front* of a plane wave

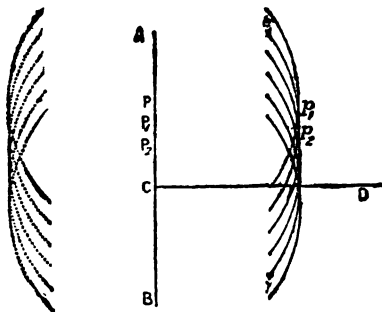


Fig. 1.

which is passing in the direction CD; i. e., suppose all particles of the ether in the plane AB (perpendicular to the plane of the paper) to be similarly and equally displaced. According to Huyghens, we must suppose every particle, P, to be itself the source of a wave, which, from the uniformity of the medium, will spread with the same velocity in all directions. With centre P, and radius the space which light passes over in any assigned interval t , describe a sphere represented in section by a circle in the figure. Do the same for adjacent points, P_1, P_2 , &c. Let p_1 be the intersection of the circles whose centres are P and P_1 , p_2 that of the circles whose centres are P_1 and P_2 , and so on. Then, as p_1 is equidistant from P and P_1 and (approximately) from all points of a small circular space between P and P_1 on the wave-front AB, all the separate wave-disturbances coming from these points to p_1 will be in the same *phase* (see WAVE), and will therefore combine so as to strengthen each other; while in other directions they will be in different phases, and combine to destroy each other. The locus of all such points as p_1, p_2 , &c., will therefore, at the end of the time t , contain all particles of the ether equally and similarly disturbed, and will thus be the new wave-front. But it is obviously a plane parallel to AB. Also the disturbance at P has passed to p_1 ; and, when the distance PP_1 is taken as very small, Pp_1 is perpendicular to the wave-front AB. Hence, in such a medium, a plane wave remains plane, and moves with uniform velocity in a direction perpendicular to its front. [There is a difficulty as to what becomes of the disturbance, which, according to Huyghens's assumption, ought to travel *back* into the dotted portions of the spheres; and it is not easy to account for the absence of this on mechanical principles. But we are content here to take for granted that no waves are propagated backwards from the main wave, as a fact clearly proved by experiment.] Since a small portion of the surface of any curved wave may be considered as plane, we now see how any such wave will be propagated in an isotropic

medium. Erecting perpendiculars at every point of the surface of the curved wave, and laying off along these lines the space which light passes over in a given interval, the extremities form a new surface, which is the wave-front after the lapse of that interval.

Reflection at a Plane Surface.—Suppose AB (fig. 2) to be a plane wave-front,

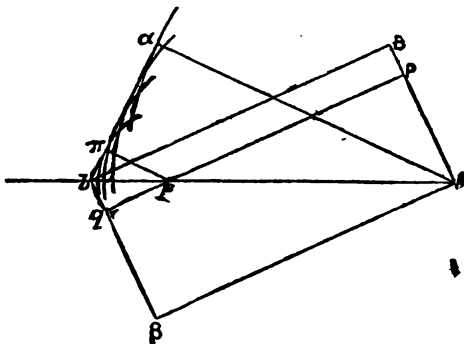


Fig. 2.

moving in the direction Bb perpendicular to AB. Let Ab be the reflecting surface, and let the intersection of the plane of the wave-front with the reflecting surface be in a line through A perpendicular to the paper. When B has arrived at b, A would have arrived at β, and P at q (where bβ is parallel to BA, and Pq and Aβ to Bb), had it not been for the reflecting surface. Hence, when B is at b, A has diverged into a sphere of radius Ab, P from p into a sphere of radius pq; and so for each point of the wave-front. Now, the spheres so described about A and p as centres obviously touch the plane bβ; consequently, they touch the other plane bα, which makes the angle Abα equal to Abβ. Now, bα is the front of the reflected

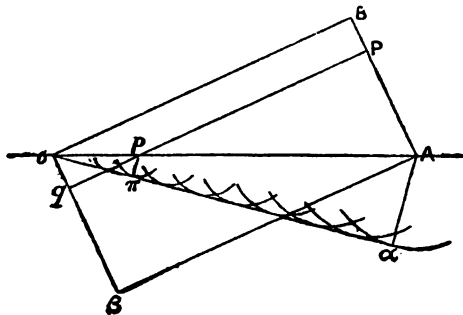


Fig. 3.

wave, and $A\alpha$ is the direction in which it is proceeding. Hence, obviously, the ordinary laws of Reflection. See CATOPTICS.

Refraction at a Plane Surface into an Isotropic Medium.—Here we take account of the change of velocity which light suffers in passing from one medium to another. In fig. 3, A, P, B, b , p , q , and β represent the same as before—but suppose $A\alpha$ now to represent the space through which the wave travels in the second medium, while it would travel from B to b in the first. With centre A, and radius $A\alpha$, describe a sphere. Let $b\alpha$ touch this sphere in α . Then $b\alpha$ is the front of the refracted wave. For, if $p\pi$ be drawn perpendicular to $b\alpha$, we have

$$p\pi : A\alpha :: bp : bA :: pq : A\beta.$$

Hence, while A travels to α , and B to b , P travels to p , and thence to π . And the sines of the angles BAb and $Ab\alpha$, which are the angles of incidence and refraction, are to each other as Bb to $A\alpha$, i. e., as the velocity in the first medium is to that in the second. See DIOPTRICS.

It is obvious from the cut that, the *less* is the velocity in the second medium, the more nearly does the refracted ray enter it at right angles to its surface. As a contrast, we may introduce here a sketch of Newton's admirable investigation of the same problem on the corpuscular hypothesis. Let AB (fig. 4) be the common surface of the two media. PQR the path of a corpuscle.

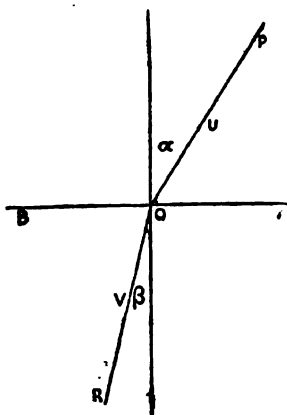


Fig. 4.

Let U and V be the velocities in the two media. α and β the angles of incidence and refraction. Then the forces, which act on the corpuscle, being entirely perpendicular to the refracting surface, the velocity *parallel* to that surface is not altered. This gives

$$U \sin. \alpha = V \sin. \beta.$$

Also the kinetic energy is increased by the loss of potential energy in passing from the one medium to the other. Hence the square of V exceeds that of U by a quantity which depends only on the nature of the two media and of the corpuscle. This shews that V is the same whatever be the direction of the ray, and then the first relation proves that the sines of the angles of incidence and refraction are *inversely* as the velocities in the two media; i. e., the refracted ray is more nearly perpendicular to the refracting surface the *greater* is the velocity in the second medium. It is very singular that two theories, so widely dissimilar, should each give the true *law* of refraction; and, in connection with what has just been said, it may be mentioned, that on the corpuscular theory a corpuscle passes from one point to another with the least *action*, while on the Undulatory Theory it passes in the least *time*. Hamilton's (q. v.) grand principle of *Varying action* includes both of these.

Interference.—Fresnel's mode of exhibiting this phenomenon (whose discovery, as before said, is due to Young) is very simple and striking. An isosceles prism of glass, with an angle very nearly 180° , is placed, as in fig. 5, symmetrically in front of a brilliant point (the image of the sun formed by a lens of very short focus, for instance). The effect of the prism is that light which passes from O through the portion QR appears to have come from some point such as A (the image of O as seen through the upper half of the prism). Similarly, the light which passed through PQ appears to come from some point B. The light which has passed through the prism

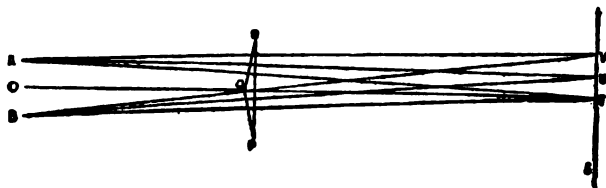


Fig. 5.

is to be received on a white screen ST. At the point T, which is in the prolongation of the line OQ, the distances TA and TB are equal; but for no other point, as U, in the line ST, are UA and UB equal. Suppose U and V to be such that UA and UB differ in length by half a wave-length of some particular color, VA and VB by a whole wave-length of the same; then waves arriving at T, as if from A and B, have passed over equal spaces, and consequently their crests coincide, so that at T they reinforce each other. But at U, a hollow from A is met by a crest from B, so that darkness is the result. At V, again, crest and crest coincide. And so on. Hence, if we are experimenting with one definite color of light, the effect on the screen is to produce at T, V, &c., bright bands of that color, all parallel to the edges of the prism PQR. At points like U, there are dark bands. And the length of a wave can easily be calculated from this experiment; for the lengths of OQ and QT can be measured, and knowing the angles of the prism and its refractive index (see REFRACTION) for the particular color employed, we can calculate the positions of A and B. We have then only to measure the distance TV between the centres of the two adjoining bright bars, and then geometry enables us to calculate the difference of the lengths VA and VB, which, as we have seen, is the length of a wave. The results of this experiment shew how very minute are these wave-lengths for visible rays. Thus, for

Extreme Red, the wave-length in air is.....	Inch. 0.000286
“ Violet, “ “ “	0.000167

These are, roughly, the 1-40,000th and the 1-60,000th of an Inch. Seeing, then, that light describes 900,000 miles per second, the number of waves which enter the eye per second are—

Extreme Red.....	480 millions of millions.
“ Violet.....	780 “ “

These numbers, compared with those of sonorous waves (see SOUND) shew the extraordinary difference in delicacy between the optic and auditory nerves. But whereas the range of the ear is somewhere about 12 octaves, that of the eye is less than one.

Diffraction.—This has been already illustrated in a previous volume.

Dispersion.—We have just seen that, by Fresnel's interference experiment, waves of different lengths are separated (for in the last figure the position of the bright line, V, depends on the length of the waves which produce it). But the different colors are also separated by common refraction, as in Newton's celebrated experiment. See SPECTRUM. This shews, of course, that in refracting media, waves of different colors move with different velocities; and, as the violet are more refracted than the red, it appears that the shorter waves move more slowly in glass or water than the longer ones. In free space, waves of all lengths travel with equal speed, else (see ABERRATION) all stars ought to appear drawn out into spectra, in consequence of the earth's annual motion. Also, a star suddenly breaking out, or suddenly vanishing (a pheno-

menon several times observed), should flash out first red, and gradually become white, or should gradually decay from white to violet, which is not observed to be the case. These facts are the most difficult to explain of any to which the Undulatory Theory has yet been applied. Fresnel, indeed, appears to have been in possession of a solution of the difficulty, but the Appendix to one of his papers, to which he more than once refers as containing this explanation, was not found among his MSS. Cauchy and others have, however, by delicate investigations, shewn that, *if the forces exerted by the molecules of a refracting body on the ether are exerted through distances comparable with the length of a wave*, the velocity of light will then depend on the wave-length. The velocity is, in fact, shewn to be represented by a formula such as this :

$$A - \frac{B}{\lambda^2}$$

where A and B are constant quantities for a given medium, and λ is the length of a wave. The larger λ is, the less is the second term of the formula, and therefore the velocity is the greater. A very singular result follows from this formula—viz. that the velocity becomes more and more nearly equal to A as the wave-length is greater. Hence, waves of low radiant heat, which (see HEAT) are merely waves of light which are incapable of producing vision, must be crowded together towards a limit, not very far beyond the red end of the spectrum.

Polarisation.—We now come to a set of phenomena which give us some further information as to the nature of luminiferous waves. When two beams of light, such as those in Fresnel's experiment, are polarised in planes perpendicular to each other (see POLARISATION) before they meet, they do not interfere. This is in accordance with the assumption required for the explanation of the existence of polarisation itself—viz., that the vibrations of the ether take place *transversely* to the direction of the ray.

Double Refraction.—Our assumptions, forced upon us by experimental results, are now so far complete that we may proceed, after Fresnel, to apply them to the explanation of double refraction. See POLARISATION; REFRACTION, DOUBLE. This explanation is extremely beautiful, and when published, was justly hailed as the greatest step in physical science which had been made since Newton deduced the facts of physical astronomy from the law of gravitation.

As we have seen above, in treating of simple reflection and refraction, that the form and velocity in and with which a disturbance spreads from any point of a wave, is all that is required for the determination of the course of a ray, we must endeavor to find the form in which a disturbance spreads in a double-refracting crystal; and this should lead us to a construction for each of the two rays.

Huyghens had already pointed out that one of the two rays produced by Iceland spar follows the ordinary law of refraction. Hence, the disturbances which give

rise to this ray are propagated in spherical waves in the crystal. He shewed also that the other ray could be accounted for, if the disturbances to which it is due were propagated in the form of an oblate spheroid touching the sphere with the extremities of its axis, that axis being parallel to the crystallographic axis of the mineral. The following diagram (fig 6) will make this clear: P is the point where the ether is disturbed. Two waves spread from P in the form shewn in the cut, the line APB being the axis of rotation of the spheroid, and parallel to the axis of the crystal. Thus, let rays αA , &c. (fig 7), of which AB is the wave-front, fall upon the surface Ab of such a crystal; and let AC be the direction of its axis. Draw, about A as centre, the sphere and spheroid into which the disturbance

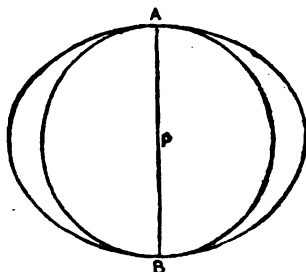


Fig. 6.

at A spreads in the crystal while light in air passes from B to b. Then if planes be drawn through the line b (perpendicular to the paper) so as to touch the

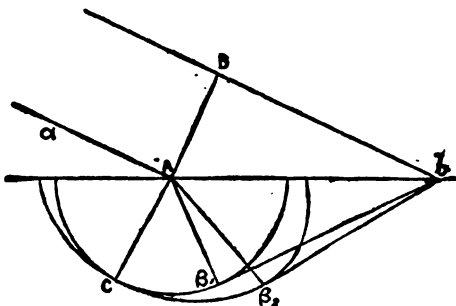


Fig. 7.

sphere in β_1 , and the spheroid in β_2 , these planes will touch respectively all the intermediate spheres and spheroids produced by disturbances at points between A and b, [This is evident from simple geometry.] Thus, $b\beta_1$, and $b\beta_2$ are the new wave-fronts; and the ray αA , falling on the crystal, is divided into the two $A\beta_1$, and $A\beta_2$. Of these, $A\beta_1$ is the ordinary ray, and, being produced by spherical waves, has all the properties of a ray ordinarily refracted. It obviously moves perpendicularly to its front, as $A\beta_1$ is perpendicular to $\beta_1 b$.

But it is otherwise with $A\beta_2$, which is, in general, *not perpendicular to its front*, $\beta_2 b$. Again, if AC, the axis of the crystal, be not in the plane of incidence, the ray $A\beta_2$ is not in that plane; so that here we have *refraction out of the plane of incidence*.

The exact accordancy of this construction with observation was proved by the careful experiments of Wollaston. We have only to add, that the two rays $A\beta_1$ and $A\beta_2$ are, in all cases, completely polarised in planes at right angles to each other.

The experiments of Brewster shew that in by far the greater number of minerals and artificial crystals, both rays are extraordinary—i. e., neither of them can be accounted for by disturbances propagated spherically in the crystal. But no tentative process could lead to the form of the wave-surface in this most general case. Here Fresnel's genius supplied the necessary construction.

He assumes that the ether in a crystallised body is possessed of different rigidity, or different inertia, in different directions; a supposition in itself extremely probable, from the mechanical and other properties of crystals. In the general case, there are shewn to be three principal directions in a crystal, in any one of which, if the ether be displaced, the resulting elastic force is in the direction of the displacement. Each of these is, in all cases, perpendicular to the others. Any given displacement of the ether corresponds to partial calculable displacements parallel to each of these lines, and thus the elastic force consequent on any displacement whatever is known if we know those for the three rectangular directions. All the calculations are thus dependent on *three* numbers only, for each substance.

To find the form in which a disturbance will spread, Fresnel proceeds as follows. Let the plane of the paper represent the front of a wave in the crystal, and suppose a particle of ether to be displaced in it from A to B (fig. 8). This displacement may be resolved (by the law of the parallelogram of velocities, forces, &c.) into two components in any two directions in the plane of the paper. Assume AP

to be one of these, and let PQ be the force produced by disturbing the particle of ether from A to P . In general, PQ will not lie in the plane of the paper. Let fall a perpendicular, QR , upon the plane of the paper. In general, the point R will not lie in AP . The portion RQ , of the elastic force of the ether, Fresnel neglects, because it would produce vibrations perpendicular to the wave-front, i.e., similar to those of sound, and he assumes that such normal vibrations do not produce visible light. We shall recur to this point. Fresnel now assumes that the vibrations which will be propagated continuously in the crystal are such as have PR coincident in direction with AP ; and then the rate of their propagation will depend upon the ratio of PR to PA . He shews by mathematical reasoning that there are two such directions in every wave-front, and that they are always perpendicular to each other. This, of course, at once accounts for double refraction, the complete polarisation of each of the two rays, and their being polarised in planes perpendicular to each other. The original plane wave is now broken into two, both parallel to the first, but in general moving at different rates. He next considers a disturbance at any point in a crystal as equivalent to waves having fronts in every plane passing through that point, and investigates mathematically the form of the surface which is touched by the planes of all the pairs of polarised rays which have (in any given time) proceeded from each of those wave-fronts. The form of this surface is very remarkable. It is symmetrical with reference to three planes at right angles to each other. These, of course together, cut it into eight parts, one of which is figured below (fig. 9). From this it appears, though Fresnel did not perceive it, that the surface has four conical cusps, as they are called, the inner portion seeming to be drawn through a hole, as it were, and then spreading out again to form the outer portion. The external appearance of these points very much resembles the portion of an apple round the point of attachment of the stalk. Fresnel shewed that, in particular cases, when two of the three principal elasticities are equal, this surface degenerates into the sphere and spheroid of Huyghens already described for Iceland spar; and that, when all three are equal, it becomes a single sphere, as in glass, water, and other singly refracting bodies. All this, of course, is in complete accord with experiment. But there is vastly more. If we use the wave-surface of Fresnel to construct the refracted rays, just as we employed the sphere for simple refraction, or the sphere and spheroid for Iceland spar, we find generally two definite refracted rays (both usually out of the plane of incidence) for one incident ray. But Hamilton (q. v.), who was the first to perceive the existence of the cusps already described, saw that they indicated the existence of a very remarkable phenomenon, to which he gave the name of Conical Refraction (q. v.). The ray, which, in the crystal, passes from A to O (the cusp, see last figure) has not, like other rays such as ApP , two definite wave-fronts. For if at p and P , where the line ApP meets the inner and outer portions of the wave-surface, we draw tangent planes, these are the definite fronts of the corresponding waves; so that such a ray will split into two only, on leaving the crystal. But AC intersects the surface at C , where it is conical, and has an infinite number of tangent planes, so that when it leaves the crystal it will split into an infinite number, forming a hollow cone. Hamilton's prediction then was: If a single ray of light be made

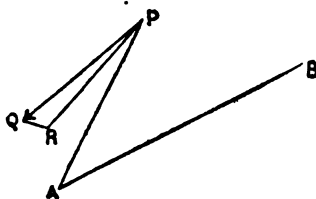


Fig. 8.

He shews by mathematical reasoning that there are two such directions in every wave-front, and that they are always perpendicular to each other. This, of course, at once accounts for double refraction, the complete polarisation of each of the two rays, and their being polarised in planes perpendicular to each other. The original plane wave is now broken into two, both parallel to the first, but in general moving at different rates. He next considers a disturbance at any point in a crystal as equivalent to waves having fronts in every plane passing through that point, and investigates mathematically the form of the surface which is touched by the planes of all the pairs of polarised rays which have (in any given time) proceeded from each of those wave-fronts. The form of this surface is very remarkable. It is symmetrical with reference to three planes at right angles to each other. These, of course together, cut it into eight parts, one of which is figured below (fig. 9). From this it appears, though Fresnel did not perceive it, that the surface has four conical cusps, as they are called, the inner portion seeming to be drawn through

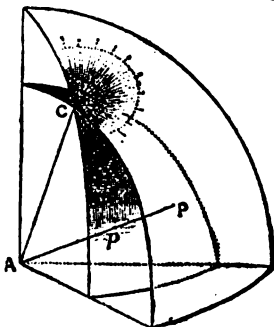


Fig. 9.

they indicated the existence of a very remarkable phenomenon, to which he gave the name of Conical Refraction (q. v.). The ray, which, in the crystal, passes from A to O (the cusp, see last figure) has not, like other rays such as ApP , two definite wave-fronts. For if at p and P , where the line ApP meets the inner and outer portions of the wave-surface, we draw tangent planes, these are the definite fronts of the corresponding waves; so that such a ray will split into two only, on leaving the crystal. But AC intersects the surface at C , where it is conical, and has an infinite number of tangent planes, so that when it leaves the crystal it will split into an infinite number, forming a hollow cone. Hamilton's prediction then was: If a single ray of light be made

to pass through a plate of a biaxial crystal in the direction AC (limiting it, for instance, by sheets of tinfoil with small holes in them properly fixed on each side), it will enter and emerge as a hollow cone. Also the plane of polarisation will differ for different rays in this cone. Lloyd completely verified this wonderful prediction by experiments made with a plate of *Arragonite* (q. v.). But more, Hamilton observed that (see last figure) the wave-surface can be touched by a tangent plane in a circle surrounding the cusp. If, then, we make the construction of fig. 1 with Fresnel's wave instead of the sphere and spheroid, there will be a definite direction of the incident ray αA , for which the tangent planes $b\beta$, and $b\beta'$, in that figure will coincide, and will touch the wave-surface in the circle about the cusp. Any line drawn from A to a point in that circle will be a direction for a refracted ray. Hence the ray αA will be broken up into a hollow cone of rays, the vertex of the cone being A, and its base this circle. If the crystal be cut into a plate, each ray will of course emerge parallel to αA , and the *ensemble* of them will form a hollow cylinder. The prediction, then, is that a single definite ray, falling in a given direction on such a plate of crystal, will emerge as a hollow cylinder. This, and the predicted laws of the polarisation of the light of the cylinder, were also verified by Lloyd.

"The formulæ which led to such triumphantly successful predictions *may* have been deduced from incomplete or even erroneous premises; but they *represent a truth*, and must in time conduct us step by step back to ultimate proof of the truth of Fresnel's assumptions, and of the Undulatory Theory of Light, as now understood, or shew us what modifications may be required in the original conceptions."

It would unduly lengthen this article, and besides would lead us into discussions far too recondite for a work like this, to enter upon the question of whether the vibrations in polarised light are *perpendicular to* or *in* the plane of polarisation, a subject which has recently been well investigated by Stokes (q. v.); or to consider the production of elliptically polarised light by reflection at the surface of metals, diamond, &c.; and various other most important points of the theory. We can only mention that Green, Cauchy, Stokes, and others, who have entered deeply into the mechanical question of laminiferous vibrations, have found themselves obliged to take into account the *Normal wave*, which, as we have seen, Fresnel neglected.

Fluorescence (see PHOSPHORESCENCE), Spectrum Analysis (see SPECTRUM), and various other important recent additions to the theory, must be merely mentioned; as also the very remarkable observation of Maxwell, which appears to connect Light and Electricity, and was derived from a theory which assumes the ether to be the vehicle of Electricity and Magnetism as well as of Light and Heat, and by which it appears that the velocity of Light is expressible in terms of the static and kinetic units of Electricity.

For further information, we refer the reader to Lloyd's "Wave-theory," an excellent elementary treatise; while to the more advanced mathematician we may commend Airy's "Tract on the Undulatory Theory," and Herschel's article "Light" in the "Encyclopædia Metropolitana."

UNDY, in Heraldry, the same as Wavy. See HERALDEY.

UNFERMENTED BREAD. Under this heading we may briefly notice one or two improvements which have been introduced into the manufacture of *AREATED BREAD* since the article on that subject was published in the first volume of this "Encyclopædia" in 1860, and the general bearings of this kind of baking, and of the bread thus produced, upon public health and upon the subject of medical dietetics. In 1868, the "Aërated Bread Company (Limited)" was established for purchasing from the patentee, Dr. Daughlish, the sole right of manufacturing this kind of bread in and around London; and from that time, the use of this new article of food has become much more extensive. Indeed, at the present day, Daughlish's Aërated Bread is manufactured (by purchase of the right to use the process) not only in most of the large towns in England, but also in Melbourne, Adelaide, and Sydney. In the working of the original patent, it was found that the pressure at the commencement of the process of driving the mixed ingredients from the iron box through a cock or tap at the bottom was so violent as to give almost an explosive expansion to the ejected portion of dough, causing the structure of

the bread more to resemble whipped cream or froth than fermented bread. This was a point of greater importance than might have been anticipated, because it is found by experience that the flavor and other palatable qualities depend in a great measure on the internal arrangement of the loaf. Moreover, a great part of the pressure obtained was entirely wasted. In the "Times" city article of December 30, 1864, a new patent is described as having been taken out by Dr Daughlish, whose purposes are first and chiefly, to improve the "piled elastic texture" of aerated bread; and secondly, to provide mechanical means for dividing the dough into the requisite exact and uniform measured quantities for loaves, and for delivering each loaf into the tin in which it is to be baked. Dr Daughlish's last patent—his new mechanical or travelling oven—was only completed shortly before his death, which took place in the spring of 1866. In this oven, the loaves, after being placed on the movable bottom at the mouth, are carried with a regular intermittent motion, in an endless chain, which forms the movable bottom, through a chamber varying in length from 20 to 50 feet, to the end or tail of the oven. This chamber is heated by two or more furnaces, the fires of which are kept separate, each furnace heating its own portion. Small windows are inserted at intervals, by means of which the baking can be watched during its progress. The mouth of the oven is protected by two doors, which are lifted and shut alternately by an arrangement of apparatus worked by the same power which causes the endless chain constituting the movable bottom to traverse the length of the oven; the work of charging the oven goes on incessantly while the loaves are on their journey towards the tail of the oven; and the opening and shutting of the two oven doors is so arranged as to prevent the escape of the heat or steam from the interior of the oven. On the arrival of the loaves at the tail of the oven, the baking process is completed, and they are tipped off the revolving bottom, falling, by their own weight, on to a table placed ready to receive them. The mechanism at the tail of the oven is likewise so arranged as to prevent the escape of the heat or steam in the oven. By means of this travelling oven, the old and laborious plan of putting into and taking out of the oven each loaf separately with the peel (so injurious to the health of the journeyman baker) is henceforth abolished in the making of aerated bread.

Hitherto, the carbonic acid gas employed in the manufacture of aerated bread has been solely obtained from carbonate of lime and sulphuric acid. The Aerated Bread Company recently made experiments regarding the possibility of applying the carbonic acid of the great London breweries (now a wasted product) to the aëration of their bread, and the results hitherto obtained have been most satisfactory; while there is not the slightest doubt of the essential purity of the gas, in so far as deleterious matters are concerned, the delicate flavor of both hops and malt conveyed in the form of aromatic vapor by the gas to the dough communicates to the bread a singularly agreeable and palatable flavor.

No one who takes an interest in the sanitary conditions of various trades, and who has read Mr Tremenhoe's "Report on the Sanitary Condition of Journeyman Bakers," drawn up in 1863, and published by order of government; or a very powerful article upon that commissioner's Report in the "Times" of August 1863; or a late pamphlet by Dr Guy on the same subject, can doubt that the general introduction of aerated bread would cause the saving of a large number of human lives, now annually sacrificed in the London bakeries alone. Dr Guy states that no class of men, save the Redditch needle-grinders, are liable to so severe and often fatal diseases of the chest. Forty-two years is rather over the average duration of life among them, and they are often completely enfeebled in very early life by frequent attacks of rheumatism. Under the new system, the business of a journeyman baker, from being almost certainly fatal, would become a healthy rather than a dangerous one. The evidence given in Mr Tremenhoe's Report treats not only of the bakers, but also of "the Bread we eat." The statements made on the latter subject are so appallingly disgusting and filthy, that, in mercy to our readers, we decline to repeat them; and those who honestly desire to know how (at all events, in a vast number of bakeries) their bread is really made, may readily consult his Report.

The dietetic advantages of aerated bread are apparently so obvious, that it is surprising that they are not even more generally recognized than seems at present to be the case. Its perfect cleanness and purity, its light and uniform texture, and its

sweet and agreeable flavor, are strong claims upon acceptance. To the working-man, it is especially suited, because it retains much of the ingredients of the wheat which enter into the formation of blood and muscle, and are allowed to escape in fermented bread. It is strongly recommended by medical men not only as an article of ordinary diet, but particularly in cases of indigestion; and according to Dr Corfe of the Middlesex Hospital, most especially "in those case of dyspepsia which so often affect the brain-workers of the great metropolis, men who work for the press, &c." Mr Sanger, medical officer at the Convalescent Hospital, Seaford, has recently pointed out, amongst many medical uses of this bread, its use as a food for infants when they are brought up wholly or partially by hand. "I have seen," he observes, "children pining away from diarrhoea and atrophy under a diet of common pap, or *Tout les Mois*, or any of the compounds which are vaunted as wonderful food for infants, recover in a very short time after the aerated bread has been substituted for them. This bread forms a soft jelly-like compound when mixed with milk and water, which is easily sucked through the tube of a common feeding-bottle, and with a little fine sugar, makes a food of which infants grow very foud."—"Lancet," December 10, 1864. Cases of indigestion, flatulence, &c., not unfrequently occur in which no kind of bread (even well-made country bread) can be borne with comfort. In such instances, if there is no ready access to aerated bread, it may be obtained weekly in a tin box from London, as, amongst other advantages, it possesses that of being almost as palatable on the tenth day as on the day of its baking. For a description of the latest improvements in aerated-bread machinery, excepting the travelling oven, the reader is referred to the "Mechanics' Magazine," March 24, 1865.

UNGHVA'R, an important market-town in the north-east of Hungary, is charmingly situated on the river Ugh. 90 miles north-north-east of Debrecin. It is the residence of a bishop, and contains a very old castle, a beautiful church, a seminary, and gymnasium. Trade is carried on in salt, cattle, and wine, particularly the last, vines being extensively cultivated in the vicinity. The population of U. in 1869 amounted to 11,017.—U. is also the name of a county or district containing about 1200 square miles, and a population of 180,000.

UNGUENTS, or Ointments, are employed in medicine as external applications. They consist of some active agent in solution or in the form of a soft extract, or in fine powder, carefully rubbed up with some kind of fatty matter, or a mixture of several such matters, as prepared lard, prepared suet, white wax, yellow wax, olive oil, and almond oil. There are no less than 38 ointments in the British "Pharmacopœia." Some, as the ointments of aconitia, atropia, and belladonna, are employed to allay neuralgia and local pain; simple ointments (consisting of white wax, prepared lard, and almond oil) are employed in dressing raw and blistered surfaces; the ointments of cantharides and of savin are used to keep up the discharge from issues or blistered surfaces; the ointments of creosote, galls, carbonate of lead, oxide of zinc, &c., serve as astringents; those of ammoniated mercury, calomel, nitrate and red iodide of mercury, iodine, iodide of potassium, elemi, resin, and turpentine, act as astringents of varying power, and that of red oxide of mercury as a mild caustic. Many of the ointments are of special service in skin diseases, and sulphur ointment is the specific application for itch.

UNGUICULATA (Lat. clawed). In Zoology, a section of the class Mammalia, consisting of those animals which have toes furnished with nails or claws. In the system of Linnæus, it includes the orders *Bruta*, *Glires*, *Primates*, and *Fera*; in that of Cuvier, the orders *Bimana*, *Quadrumana*, *Carnaria*, *Marsupialia*, *Rodentia*, and *Edentata*.

UNGULATA (Lat. hoofed), in Zoology, a section of the class Mammalia, consisting of those animals which have hoofs. In the system of Linnæus, it includes the orders *Bellua* and *Pecora*; in that of Cuvier, the orders *Pachydermata* and *Ruminantia*.

UNGULED, in Heraldry, a term applied to the tincture of the hoofs of an animal; e. g., Azure, a stag trippant or, attired and unguled gules, the arms of the family of Strachan in Scotland.

UNICORN (Lat. *unum cornu*, one horn), an animal probably fabulous, men-

tioned by ancient Grecian and Roman authors as a native of India, and described as being of the size of a horse, or larger, the body resembling that of a horse, and with one horn of a cubit and a half or two cubits long on the forehead, the horn straight, its base white, the middle black, the tip red. The body of the animal was also said to be white, its head red, its eyes blue. It was said to be so swift that no horse could overtake it. The oldest author who describes it is Ctesias, who resided for many years as physician at the court of Artaxerxes Mnemon, and who wrote about 400 B.C. His information, however, was all at second-hand. He calls it the Wild Ass (*Oncos asinus*). Aristotle briefly mentions it under the name of Indian Ass, saying: "We have never seen a solid-hoofed animal with two horns, and there are only a few of them that have one horn, as the Indian Ass and the Oryx." Pliny nearly follows Aristotle, but says that the Indian Ass is one-hoofed, and the Oryx two-hoofed. He speaks also of the *Monoceros*, a very fierce animal, with the body of a horse, the head of a stag, the feet of an elephant, the tail of a wild boar, and a single horn. All these accounts are evidently untrustworthy, and much tinged with fable. Not more credible are those of more modern authors. Lobo, in his *History of Abyssinia*, describes the U. as resembling a beautiful horse; but there is no good evidence of the existence of any such animal there or in any part of the world. Its existence, however, is not to be decided against on any other grounds; for there does not appear to be anything monstrous or absurd in the notion. Although the descriptions of the U. given by the ancients are very unlike the Indian rhinoceros, yet probably that animal was the origin of them all. In like manner, it seems probable that the head of a U., which Barrow saw depicted on the side of a cavern in South Africa, and the head of a U. described and figured by Campbell in his "Second Journey in South Africa," are to be referred to some species of rhinoceros. The word U. is unhappily used in versions of the Old Testament for the Hebrew *reém*. The Septuagint led the way in this, by using the Greek *monoceros*; and it has been supposed by many that the animal meant is a rhinoceros. The *reém* was, however, certainly not a one-horned, but a two-horned animal. In *Deut. xxxiii. 17*, where the English version has "horns of unicorns," the correct translation is "horns of a *reém*." Other circumstances, as an allusion to the gambolling of the young, are also unfavorable to the idea that a rhinoceros is intended.

The U. is perhaps best known as a heraldic charge or supporter. Two unicorns were borne as supporters of the Scottish royal arms for about a century before the union of the crowns; and the sinister supporter of the insignia of the United Kingdom is a unicorn argent, armed, crined, and unguled or, gorged with a coronet composed of crosses patée and fleurs-de-lis, with a chain affixed, passing between the fore-legs, and reflexed over the back, of the last.

UNIFORM (one form), in its Military and Naval sense, means the particular dress and equipment assigned by proper authority to each grade of officers and men. The clothing consists of one prevailing color, variously ornamented and "faced" according to the rank and corps. Although some regiments wear other colors, scarlet may be said to be the prevailing uniform of the British army; blue of the French; and white of the Austrians; dark blue is likewise the color of the British navy. It is surprising how late the introduction of compulsory uniforms took place. We find soldiers serving with corps and yet dressed after the dictates of their own fancy well into the 17th c.; while in the navy, uniforms were not fixed with certainty until the beginning of the reign of King George III.

UNIFORMITY, Act of. See NONCONFORMISTS.

UNIGENITUS, Bull, one of the most important documents in the history of Jansenism. It was occasioned by the publication of the "*Réflexions Morales*" of Quesnel (q. v.), in which all the essential principles of Jansenism were revived, and although cautiously, yet systematically explained, so as to form the basis of that practical, moral, and religious teaching which it is the object of the "*Réflexions Morales*" to convey. The book was at first simply prohibited by a brief of Pope Innocent XI., in the year 1705; but, as it found many patrons, and especially the Archbishop of Paris, Cardinal de Noailles, it was deemed necessary to subject it to a more detailed examination, the result of which was that 101 propositions were extracted from it, and formally condemned, in 1713, by a bull commencing with the word "Unigenitus." The mode of condemning these propositions was peculiar,

being that which is technically called *Damnatio in globo*. The whole body of propositions were condemned as "heretical," "false," "rash," "scandalous," "offensive to pious ears," &c.; without, at the same time, any particular propositions being pointed out as deserving any one of these specific forms of censure. This circumstance, with others, gave rise to much controversy, and to a prolonged opposition to the bull. De Noailles and other bishops refused to accept it unless with certain qualifications; on the contrary, Louis XIV. insisted on unconditional acceptance; but on the death of Louis, the Regent, the Duke of Orleans, having given his countenance to the opponents of the bull, the resistance was persisted in; and eventually a declaration was put forth in 1717, by certain bishops, four in number, appealing from the pope to a general council. This appeal was condemned by the pope, nor was it countenanced even by the Regent; but a more modified appeal "from the pope ill-informed to the pope better-informed," was afterwards published by De Noailles, which obtained many adherents, and by which the opposition was kept alive to the end of the pontificate of Clement XI. in 1721, and even under his successors, Innocent XIII. and Benedict XIII. It was not till the year 1790 that, after the formal registration of the Bull *Unigenitus* by the parliament of Paris, the party thus created in France, and known under the name of "Appellants," received its final condemnation from the civil authority, after which it gradually died out, although some relics of it are still traceable, even after all the storms of the Revolution, in the so-called "Petite Eglise." See GALLICAN CHURCH.

UNION. The crowns of England and Scotland were united under one sovereign on the accession of James VI. of Scotland to the English throne as James I. in 1603; but for above a century longer, each country continued to be ruled by its respective parliament, the interest of the one often coming into collision with that of the other. After various fruitless proposals for a closer connection of the countries, the Scotch were, in 1702, prevailed on to send 20 commissioners to London, who, with 28 English commissioners, should deliberate on the terms of a union. Their proceedings, after being broken off, were resumed in 1706. The Scottish commissioners were at first disposed for a mere federal union, and objected to the proposed assimilation of customs, excise, and regulations of trade; but a majority were at last brought over to the views of the English commissioners; and the minority, with one exception, yielded. The union, though popular in England, was the subject of great dissatisfaction in Scotland, being regarded by the bulk of the community as a surrender of national independence to a powerful rival. Addresses against it were presented from all quarters, and in some places the people rose in arms, forming regiments of horse and foot to oppose it. The treaty was, however, after strenuous opposition, ratified by the Scottish as well as the English parliament, and ultimately completed on May 1, 1707. Its principal conditions were the incorporation of England and Scotland into the United Kingdom of Great Britain, the succession of whose monarchs was to be the same as that of England. There was to be one parliament, in which the peers of Scotland would be represented by 16 of their number elected each parliament, and 45 Scotch members were to sit in the House of Commons. All rights and privileges were to be communicated between the subjects of both kingdoms, unless when otherwise agreed. The Episcopal Church was confirmed in England, and the Presbyterian in Scotland. Scotland was to retain her Courts of Session and Justiciary, and to have a separate seal for private rights and grants. While the parliament was to raise £2,000,000 by land-tax, Scotland would contribute £48,000 of that sum. The laws of trade, customs, and excise in Scotland were to be assimilated to those of England, and the coinage, weights, and measures of the two countries were to follow a uniform standard. In other matters, the laws of Scotland were to remain in force, but might be altered by the parliament of Great Britain. The separate Privy Council of Scotland, which the Act of Union left untouched, was abolished the following year.

Ireland remained a distinct kingdom till 1801, when it was united with Great Britain into the United Kingdom of Great Britain and Ireland. By the terms of the union, the separate parliament of Ireland was done away with, and Ireland was represented in the parliament of the United Kingdom by 4 lords spiritual and 28 lords temporal in the House of Lords, and 120 members of the House of Commons. Power was reserved to the sovereign to create one peer of Ireland for every three extinct peerages, and when the peerage of Ireland became reduced to 100, to create

one peerage for each one that became extinct, so as to keep the peerage of Ireland up to 100, over and above those Irish peers who are also peers of England or Great Britain. The churches of England and Ireland were united into one Protestant Episcopal Church. The subjects of Ireland were placed on the same footing as those of Great Britain in respect of trade and navigation, and in all treaties with foreign powers; and the law-courts of Ireland were to continue, subject to the regulations of parliament; writs of errors and appeals being decided by the House of Lords of the United Kingdom.

UNION COLLEGE, a seat of learning at Schenectady, New York, U.S., incorporated in 1795, chiefly by the efforts of General Philip Schuyler, a distinguished officer of the American Revolution. It was named Union from its being established by the co-operation of several religious denominations. Its first president was John Blair Smith of Philadelphia, who was succeeded in 1799 by Jonathan Edwards the younger; but its great prosperity and usefulness have been secured under the presidency of Rev. Eliphalet Nott, from 1804 until his death in 1865. By his zeal and enterprise, it was endowed, and equipped with buildings, library, and natural history cabinets. It has 18 professors and 175 students. In 1873 a school of engineering, a medical college (with 120 students), and a law school (with nearly 100 students) were associated with the U. C., now known as Union University.

UNION GOODS, a general name for such textile fabrics as are composed of more than one material; but it is applied chiefly to those made from vegetable fibres, as mixtures of flax and hemp, or jute, cotton and flax, &c. This class of manufactures has immensely increased of late years.

UNIONIDÆ. See **FRESH-WATER MUSSEL**.

UNION-JACK (from the *jacque*, or surcoat, charged with a red cross, anciently worn by English soldiers—see **JACK**), the national banner of the United Kingdom of Great Britain and Ireland, formed out of a combination of the crosses of St George (argent, a cross gules), of St Andrew (azure, a saltire argent), and of St Patrick (argent, a saltire gules), these three crosses being the national banners of England, Scotland, and Ireland respectively. The first union-jack, which was introduced by a royal proclamation in 1606, three years after the union of the Scottish with the English crown, combined only the crosses of St George and St Andrew, and may be blazoned, azure, a saltire argent surmounted by a cross gules edged of the second. This combination was by royal proclamation of date 28th July 1707, constituted the national flag of Great Britain. On the union with Ireland, a new union ensign was devised, in which the cross of St Patrick was introduced, with its four limbs edged with white on one side. This awkward specimen of heraldry forms the second and now existing union ensign. Generally speaking, it is displayed as a national ensign on flags only; but the reverse of the bronze coins of the realm contains a not very accurate representation of it on the shield of the seated figure of Britannia. The inaccuracy consists in the crosses of St Andrew and St Patrick being made to assume the appearance of a single saltire with a narrow border of equal width on each side.

UNITARIANS, a name applied generally to all who maintain that God exists in one person only, and especially to a small Christian sect of recent times, whose distinguishing tenet is the Unity as opposed to the Trinity of the Godhead. In the more general sense, the name of course includes the Jews and the Mohammedans as well as those Christians who deny the doctrine of the Trinity, and in this sense also there have been U. from the earliest period of ecclesiastical history. Until the middle of the 3d c., there seems to have been no controversy upon the subject; but from that time to the end of the 8d c., there was a succession of eminent teachers who maintained, against the ecclesiastical doctrine of the Logos, the undivided unity—or, as they expressed it—the *Monarchy* of God. From their use of this word, they are known in ecclesiastical history as the Monarchians. There are generally understood to have been two classes of them—those who taught that Christ was God in such a sense that it was the Father who became man, and was born and suffered, and who were, on this account, called by their opponents *Patripassians*; and secondly, those who held that Christ was in nature a mere man, but exalted above all other prophets by the superior measure of Divine wisdom with which he was endowed, and who therefore corresponded more nearly with the modern Unitarians. It is right to no-

tice, however, that the doctrines of the Monarchians are known to us only through the statements of opponents, and it is probable they would have disowned the more extreme views ascribed to them. To the former of the two classes we have mentioned belonged Praxeas, against whom there is a treatise by Tertullian, and Noetus; and at a later period—about the middle of the 3d c.—the famous Sabellius taught very similar doctrines. The other class was represented by Theodotus, Artemon, and especially Paul of Samosata, Bishop of Antioch, who was eventually deposed, on account of his heresy. Ceryllus, Bishop of Bostra in Arabia, who is said to have been convinced of his error by Origen, would seem, from the single sentence which records his teaching, to have belonged to this class rather than the other. The Monarchians appealed in support of their doctrines to the Old and New Testaments, and to the early opinions of the church. They are said, by Tertullian, to have consisted of the simple and the unlearned—"always," he adds, "a majority of the faithful"—a statement which shews that they must have been tolerably numerous in his time; while a writer quoted by Eusebius brings against them the apparently opposite charge of being students of geometry and lovers of Aristotle.

The grand theological struggle which followed in the 4th c. between the Arians and the Athanasians may be regarded as but another phase of the Unitarian controversy, inasmuch as Arius held that the Son was a created being, and denied his consubstantiality with the Father. On this head, the reader may consult the articles **ARIUS** and **ATHANASIUS**. We now pass on to the post-reformation period.

It is not strange that in the great stir of thought which accompanied the Reformation, some should have been found bold enough to question the grand catholic doctrine of the Trinity. Such there were even before the Social. See **SOCIUS**. Among the earliest may be mentioned Hetzer and Bassen, both of whom were executed in 1599, the former, however, not exclusively for his religious opinions; Deuck, Campanus, and the famous Spaniard, Michael Servetus (q. v.). So widely, indeed, was the Unitarian doctrine diffused that it was thought necessary, in the first article of the Augsburg Confession, to condemn the modern Samosatians, who deny the personality of the Word and Spirit, declaring the former to be a proper spoken word, and the latter a divine influence; and as early as 1527, one Andr. Althamer published a work against "the modern Jews and Arians under a Christian name, who deny the Deity of Christ." Under the influence of the elder Socinus, Unitarianism gained many adherents in Venetia. Poland and Transylvania, however, became its principal strongholds, and in those countries, favored by circumstances, it struck the deepest roots. In Poland, the nobility, protected from persecution by their class privileges, proved singularly favorable to a movement which seemed more destructive of the traditions of the Catholic Church than any that had yet been entered upon; the Unitarian refugees from other countries found here a ready welcome; and in the reign of Sigismund II. (1548—1572), this party of reformers was strong enough to form itself into a separate church. At a rather later period, Poland was the principal field of labor of the younger Socinus, and Unitarianism continued to flourish there till the middle of the 17th c., when, under John Casimir, who before his elevation to the throne had been a cardinal and a Jesuit, it was extirpated by force. In Transylvania, the U. have succeeded in maintaining their existence, notwithstanding much opposition and persecution, from the Reformation to the present day. The first who openly preached Unitarianism in that country were George Blandrata and Francis Davidis (1566), and under the influence of these distinguished men, large numbers, including the king himself, embraced the new opinions. But this period of prosperity was not of long duration. In 1579, though still permitted to worship according to their conscience, the U. were forbidden to make any attempts at propaganda, or even to print their religious books. They were not, however, subjected to any violent persecution until after the incorporation of Transylvania with the Austrian Empire, which took place in 1690; but after that time they were robbed by the Roman Catholics of all their churches and church property, forbidden to build new churches without the permission of the emperor, and by degrees excluded from all government offices, even the very lowest. On the accession of Joseph II., happier times returned. Their churches were forbidden to be seized, and an indemnity was even paid them for the loss of the cathedral church of Klausenburg. They were now enabled to build new churches, and their cathedral and college at Klausenburg are said to be still two of the finest buildings in that city.

The U. of Transylvania number about 60,000, and are said to be increasing. They have an organised system of church government, with a bishop at its head. They have three colleges—that of Klausenburg, with 12 professors and 273 students; that of Torda; and that of St Keresztur.

In England, Unitarian opinions were somewhat later in making their appearance than on the continent. As early, indeed, as 1548, a priest named John Aylton was accused of Arianism, and escaped with his life only by recantation; and during the reigns of Edward VI., Mary, Elizabeth, and James I., a few suffered martyrdom on similar charges. But during the reign of James I., continental Socinianism began to exercise considerable influence in England, and continued to do so to the end of the century, so much so that, in 1666, Dr Owen wrote that "the evil is at the door, that there is not a city, a town, scarce a village in England, wherein some of this poison is not poured forth;" and how deeply the church of England was infected with it may be inferred from the no doubt exaggerated statement of Palmer, who, in 1706, spoke of "troops of Unitarian and Socinian writers, and not one dissenter is found among them." Many eminent men of the time, including Milton, Locke, and Newton, and in the next century, the famous apologist, Lardner, must be numbered among the U.; but it was in the last decade of the 17th c. that the controversy on this subject was most active, and at this time were published the old Unitarian tracts—a serious of anonymous writings marked by eminent learning and talent. Hitherto, however, the U., with the exception of the society formed in Loudon by John Biddle (q. v.), which did not survive its founder, had no organised existence. But after the passing of the Toleration Act in 1689, whereby Nonconformity was made legal, the way was prepared for that gradual change by which the orthodoxy of the English Presbyterians passed into Unitarianism. It was at this time that most of the old Presbyterian chapels were founded, and the trusts being open—i. e., not committed to any doctrinal system—ministers and people were left free to adopt and promulgate whatever new opinions should approve themselves to their conscience. Thus, the U. are the legitimate successors and representatives of the 2000 Presbyterian divines who in 1662 left the Church of England in consequence of their inability to comply conscientiously with the terms of the Act of Uniformity. The ground of this separation, it should be understood, was no difficulty about the doctrinal articles of the establishment. The English Presbyterians (so called from their preference for that form of church government, for they were never able to adopt it) were originally as orthodox as their Episcopal brethren; but having refused to commit themselves to any authoritative creed, they underwent a gradual change to Arian, and at length to Unitarian, views. Many preached such views without exciting attention or controversy, and indeed, until 1812, the law which made it blasphemy to speak against the Trinity, though not strictly enforced, was still in existence. During the latter half of the 18th c., Dr Priestley (q. v.) appeared as the champion of the humanitarian view of Christ's nature, and, by the influence of his writings, secured the more open advocacy of that doctrine. In 1778, Dr Lindsey resigned his charge in the Church of England, and became pastor of the Unitarian congregation of Essex Street, London—an event which may be regarded as an epoch in the History of English Unitarianism. In 1813, the U. were placed by law fully on a par with other dissenters, and since that time there has been no attempt at persecution, with the exception of the claim made to some of their properties by certain orthodox dissenters. This claim was met by the Dissenters' Chapels Act in 1844. The U. of England and Wales are purely congregational in their church government, their only organ for combined action being the British and Foreign Unitarian Association, which holds its meetings annually in London. Their principal place of education is Manchester New College, London, which is, however, an unsectarian institution. They have also a missionary college in Manchester, and the Presbyterian College, Caermarthen, educates Independent and Unitarian ministers. They have at present about 350 chapels and 80 mission stations.

In Scotland, the religious atmosphere has never been very favorable to Unitarianism. It was in that country that the last execution for blasphemy against the Trinity took place, in the person of the unfortunate Aikenhead. Nevertheless, towards the close of the 18th c., there was a certain amount of Arianism among the Moderates in the Church of Scotland. Unitarianism, as a distinct system, was

preached at Montrose as early as 1788; and at the beginning of the present century, some attempts were made to diffuse it by means of missionary efforts. There are now seven congregations in the country. That at Edinburgh was originally a branch from the Camerounians, the strictest of Calvinists, but having adopted the principle of free inquiry, they gradually embraced Arian, and eventually humanitarian, views. This last change took place during the ministry of the late Dr Southwood Smith, about the year 1812.

In Ireland, the history of Unitarianism is intimately connected with that of Presbyterianism. It flourishes principally in the north of the island, where there is a strong infusion of Scotch blood, and where Roman Catholicism has the least influence. In 1871, there were 9378 U. in Ireland. The U. of Ireland are Presbyterians in fact as well as in name.

Unitarianism in the United States has passed through much the same phases as in Great Britain. After 1740, Arian views of the person of Christ were pretty widely diffused among the New England clergy; and in 1787, took place the first secession from the Episcopal Church, on the ground that those parts of the liturgy which imply a belief in the Trinity could not be any longer employed. From the first, the New England churches were remarkably free from the restraints of tests and creeds, and were thus prepared for the adoption of a liberal theology. By imperceptible degrees, many of them glided into Unitarianism; but it was not until about 1815 that the name began to be much used. At that time, the influence of Dr Channing (q. v.) was thrown into the scale; and since then, Massachusetts, and particularly Boston, has been the stronghold of Unitarianism in America. The U. have 363 societies in the States, and upwards of 25 in Boston alone. Harvard University, Cambridge, is not a denominational institution; but it is at present in the hands of the U., and most of their ministers are educated either there or at the Mendville Theological School, Pa. Besides the U., properly so called, the Universalists, the "Christians" of America, and the Hicksite Quakers, are understood to hold anti-Trinitarian sentiments, though they give no special prominence to the doctrine of the Divine Unity. When we have mentioned, further, that there are a few Unitarian churches in the principal colonies of Great Britain, we shall have made a sufficiently complete enumeration for the purposes of this sketch. We have, however, to add, that Unitarian sentiments, under the names of Liberal Christianity and Rationalism, are more or less widely diffused in France, Switzerland, Germany, and Holland.

We now proceed to give a brief sketch of the theological opinions by which U. are distinguished from other Christian sects. It is, of course, impossible that we should notice all the phases of belief they have passed through since the Reformation. We confine ourselves to stating the more important doctrines of the early Socinians, as they are set forth in the Racovian Catechism, and sketching rapidly the opinions of the modern U. of England and America.

The Socinians assumed, as the fundamental principle of their theology, the sufficiency of Scripture, or rather of the new Testament, which, they held, had, for all matters of faith, superseded the Old. According to their system, Christ was a true man, but conceived of the Holy Spirit; and on account of the Divine power which he has received from the Father, and his exaltation as head over all things, he is to have worship offered to him. The Holy Spirit is not a person, but a Divine influence. The Socinians rejected also the doctrine of original sin. Man, they taught, was created with a mortal nature, but by the special gift of God, was endowed with a conditional immortality. He was created innocent, but not positively righteous. The gift of immortality he forfeited by disobedience. The fall of Adam, however, being a single act, could not deprave his own nature, much less that of his posterity; and in the latter, death was not a consequence of the fall, but was simply the condition of birth and life. Thus, the actual consequence of Adam's fall was not any radical corruption of human nature, whereby it was impossible for man to do any good thing, but rather a moral deterioration, producing, with repeated acts of disobedience, an increasing tendency to sin. Man, after the fall, retained his free will, and the power of abstaining from sin if he so pleased. On the question of the merits of Christ, the Socinian doctrine was essentially different from that of all the other Protestant sects. Christ's merits did not consist principally in his death, but in his life, his teachings, and his exam-

ple. Nor was his death regarded as an atoning sacrifice, or as having any vicarious efficacy whatever, but simply as a confirmation of God's will, and the seal of the new covenant. Christ died for our sins—first, that all sinners might in this way have the assurance of forgiveness and of eternal life; secondly, that they might be drawn to Christ, and led to seek through him alone remission of their sins; and thirdly, that God might thus testify His boundless love to the human race, and might reconcile it to Himself. But the crucifixion was important chiefly as preparing the way for the great crowning miracle of the resurrection. Here, in fact, not Christ's death, but his resurrection, is the central point of the Christian scheme. By this he confirmed his doctrine of immortality, and prepared for his ascension into heaven, where he now fills the office of our great High Priest. Jesus "freed us from the punishment due to our sins, in that he continually protects us by the virtue and power which he has received from the Father, and by his intervention, defends us, as it were, from the wrath of God; and he frees us from servitude to our sins, by drawing us away from every kind of vice, and shewing us in his own person the reward of him who abstains from sin." Predestination in this system means the decree of God, made before the foundation of the world, that they who believed and were obedient should be saved, and that they who believed not and were disobedient should be damned. Justification takes place when God pardons our sins and gives us eternal life. The Socinians regarded the sacraments as simply external signs testifying to Christian faith. Hence they held infant baptism to be irrational as well as unscriptural, but thought that a custom so old and established should be tolerated.

It need scarcely be said that the systematic theology of the early Socinians is in this country quite a thing of the past; indeed, the English U., though undoubtedly more or less influenced by their continental brethren of the Reformation period, have with the latter no very direct historical connection. They seem rather to have arrived at independent conclusions, through their "rational" interpretation of Scripture, and their consistent rejection of human authority in matters of faith. The U. of the present day, like almost all Christian sects, must be divided into two classes—a conservative and a progressive class—or, as they are often called, an old and a new school. The former adopt the old rule of the sufficiency of Scripture, though with many such qualifications as the scientific criticism of the Bible has rendered indispensable. The most conservative U., for example, would not contend for the literal truth of the first chapter of Genesis, nor for the doctrine of verbal inspiration in any shape. The Bible is *not*, but it *contains*, the Word of God, is the form which best expresses their position on this subject. They generally hold the simple humanity of Christ, and even reject the supernatural birth, thinking the part of the gospels which record that event to be less authentic than the parts referring to the ministry, the death, and resurrection of Jesus. To the death of Christ they ascribe much the same kind of efficacy as we have seen was ascribed to it by the Socinians, regarding his teaching and example as the most essential part of his work, and his death as an attestation to the truth of his mission, and a preliminary to his resurrection. What, however, chiefly distinguishes the U. of this school from those of the new or progressive school, is the place which they give to the miracles as supernatural sanctions of the truth of Christianity. In this respect they must be considered as still under the influence of Locke's philosophy and the theology of Dr Priestley. Denying that man has any immediate knowledge or intuition of spiritual things, they regard Christianity as a system of moral and religious truth external to man's nature, and requiring, in proof of its divine origin, certain evidence beyond its inherent credibility and adaptation to human wants. This evidence they find in the miracles, which they accept as well-attested facts, on the same ground on which all historical facts are accepted. "If there be any truth in history," says Dr Priestley, whose influence can still be traced in the U. of this school, "Christ wrought unquestionable miracles, as a proof of his mission from God; he preached the great doctrine of the resurrection from the dead; he raised several persons from a state of death; and, what was more, he himself died and rose again in confirmation of his doctrine. The belief of these facts I call the belief of Christianity." According to this view, therefore, Christ is an ambassador from heaven to earth; the miracles he wrought are his credentials; and the moral and religious truths which he taught are his message. It is not indeed denied that many or all of those truths might be

learned from the light of nature, but they have received from Christianity a sanction which gives them a greater degree of certainty than they could otherwise possess. The U. of the progressive school, on the other hand, have abandoned the philosophy of Locke for more spiritual modes of thought. So far from regarding man as entirely dependent upon his reasoning powers for his knowledge of religion, they rather look upon him as standing in a living relationship with the one infinite source of all truth, and as having within his own nature the germs of the highest religious faith. Christianity, accordingly, they regard not as a *message* or a system of truth communicated and authenticated from without, but as the highest expression of the Divine in humanity—an expression not necessarily preternatural, but connected with the previous history of mankind by the natural laws of moral and spiritual development. To this view of Christianity, the miracles are not felt to be essential as proofs; and the truths of the gospel are thought to be quite unaffected by any judgment regarding them. The U., however, of this school, while, from their point of view, they regard the question of the miraculous as one of critical rather than religious interest, yet generally accept the miracles as historical facts, considering that there is sufficient evidence to prove that they took place. A few, but an increasing number, agree with Theodore Parker and many of the German critics in rejecting them on the two-fold ground, that they are intrinsically incredible, and that the evidence for them is conflicting and uncertain. Generally speaking, the U. of this school, like the so-called Broad Church men, are disposed to regard with favor the freest criticism of the Bible. Holding that inspiration is a quality which is not peculiar to the Bible, but common to all the most elevated religious literature, and that it in no case implies immunity from error, they maintain that the Scriptures must be subjected to the same rules of criticism and interpretation as any other book, and that each book of Scripture is to be studied not as a collection of infallible oracles, but as a record of the mind of the age in which it was produced. In this light, however, and also as a record of the world's history, they hold the Bible in the highest estimation. Such is a statement, necessarily imperfect, of the peculiarities of the two Unitarian schools in their extreme divergence from one another; it need scarcely be added that in fact they merge into each other by imperceptible gradations.

It will, of course, be understood that the U. of all shades of opinion are agreed in rejecting the entire orthodox scheme—including the doctrines of the Trinity, the vicarious atonement, the Deity of Christ, original sin, and everlasting punishment—as both unscriptural and irrational. They celebrate the Lord's Supper in their churches, not as a sacrament, but as a service commemorative of Christ's death, and expressive of spiritual communion with him. They also adhere generally to the rite of infant baptism, though there are a few Unitarian Baptist churches. In recent years, the U. have given renewed prominence to the principles of Comprehension and of Free Inquiry apart from the restraints of theological creeds, conceiving that in this they are conforming to the spirit of their Presbyterian forefathers; and many even object to the name Unitarian, as one which might be held to imply a doctrinal bond of union, and to be, to that extent, inconsistent with the fundamental principles of the body, which both now and in former times have always included unrestricted freedom of religious thought. It is impossible here to explain at greater length the Unitarian position; but it may be mentioned, as an important fact, that when, at the meeting of the British and Foreign Unitarian Association in 1866, it was proposed to add to the rules a clause defining "Unitarian Christianity," the motion was almost unanimously rejected. The motion was intended as a protest against anti-supernaturalism. Its rejection, on the other hand, was an assertion of the principle of comprehension and freedom, and was voted for by those who sympathized doctrinally with the proposer, as well as those who differed from him.—For fuller information on the history and doctrines of the U., the reader may consult Dr Beard's "Unitarianism in its Actual Condition;" the Rev. J. J. Taylor's "Religious Life of England;" Otto Fock's "Socialismus;" and Laugel's "Geschichte und Lebensgriff der Unitarier vor der Nicänischen Synode."

UNITED GREEKS. See GREEK CHURCH.

UNITED PRESBYTERIAN CHURCH, the name of a religious body in Scotland, which was constituted in 1847 by the amalgamation of the SECESSION and RELIEF CHURCHES, whose origin and history we propose briefly to narrate.

THE SECESSION CHURCH.—The causes which led to the formation of the Secession Church, in order to be thoroughly understood, would require to be unfolded at much greater length than our space permits. But some notice of them, however brief, is absolutely necessary. It is well known that the Reformation from popery in Scotland was a very radical and decisive affair in regard to both the doctrine and government of the church. The people became strongly Calvinistic and Presbyterian; and after the accession of James to the English throne (1603), their attachment to their ecclesiastical system became stronger still. The efforts of that monarch to supplant it by Episcopacy proved unavailing, so far as the great body of the commons and gentry were concerned; but moved by various considerations, into which religious conviction entered only as a very subordinate element, many of the Scottish nobles adopted the church principles of their sovereign, and after the Restoration (1660), supported the governments of Charles and James in their persecution of the Covenanters. See COVENANTS; SCOTLAND; SCOTLAND, CHURCH OF. At the meeting of the Scottish Estates in 1690, Episcopacy, which, in Scotland, had obtained a temporary supremacy under the rule of Sharp (q. v.) and Lauderdale, and had, besides, become synonymous with adherence to the House of Stuart, was abolished, and Presbyterianism re-established. One unavoidable consequence of this was the abolition of the *right of patronage*, for in a multitude, probably the great majority, of cases, the exercise of this right would have placed the nomination to ecclesiastical benefices in the hands of Episcopalian landholders, and thereby imperilled the existence of a sound Presbyterian ministry. But although there were still many zealous Presbyterians in Scotland, especially among the peasantry, the spirit of the nation as a whole had gradually undergone a great, and, in the opinion of some, a disastrous change, so far as religion was concerned. A kind of torpor seized the upper and middle classes after the "glorious Revolution," and earnestness growing unfashionable, was succeeded at last by fanaticism. A proof of the latitudinarianism of the times is the fact, that some hundreds of Episcopalian curates were allowed to retain the parishes in which they had been arbitrarily stationed, on subscribing the *Confession of Faith*; and great numbers of laymen became elders in a church whose strict adherents they had themselves but recently hunted even to death. This obstruction into the church of curates whom Bishop Burnet describes as "the worst preachers I ever heard, ignorant to a reproach, and many of them openly vicious," produced, as may easily be conceived, a pernicious influence on the purity of ecclesiastical discipline; and in 1712, when the obnoxious *Law of Patronage* was restored, the triumph of the "court" or "moderate" party in the church may be regarded as complete. See MARROW CONTROVERSY. Violent settlements, effected by the agency of dragoons, now became frequent, and greatly irritated the people, whose petitions and appeals were almost invariably disregarded; and finally, in 1730, the Assembly enacted that in future no reasons of dissent "against the determinations of church judicatories" should be entered on record. This attempt to gag the mouths of congregations was more than some could bear, and in October 1733, the Rev. Ebenezer Erskine of Stirling, in a sermon delivered in his capacity of moderator before the synod of Stirling and Perth, denounced in solemn and impassioned words the recent legislation and spirit of the church. A committee was immediately appointed to consider the matter, and reported rather vaguely but unfavorably at the ensuing meeting of synod; in consequence of which, Mr Erskine, after three days' "warm reasoning," was found deserving of censure by a majority of six. He immediately protested (as did also twelve other ministers and two elders), and appealed to the next General Assembly, which, sustained the decision of the synod, and ordered the rebuke and admonition to be administered. "In order to terminate the process," Erskine, of course, had to submit to censure, but left a written protest on the table of the Assembly, in which he declared his intention to continue testifying against the "defections" of the time. This protest was also signed by William Wilson, minister of Perth; Alexander Moncreiff, minister of Abernethy; and James Fisher, minister of Kinclaven. The Assembly was indignant, and next day ordained "that the four brethren appear before the Commission in August next, to express sorrow for their conduct, and retract their protest;" on pain of being suspended from their ministry. This they refused to do, and in consequence were declared "no longer ministers of the church" (November 1733), whereupon they handed in a final written protest, in which, after referring to the "defections from our reformed and covenanted princi-

pies" of the "prevailing party," they protested that they were obliged to **MAKE A SECESSION FROM THEM**, and appealed unto the first free, faithful, and reforming General Assembly of the Church of Scotland.

This was the origin of the famous "Secession Church," which has made so deep an impression on the religious life of Scotland. At first composed of only four ministers, it rapidly began to gather strength. Little Christian societies were everywhere formed, which were gradually supplied with pastors either from the Establishment, or from pious youths trained to the work of the ministry by Erskine and his friends. Erskine and his friends drew up a statement of their reasons for separation, which was published under the title of "A Testimony to the Doctrine, Worship, Government, and Discipline of the Church of Scotland, or Reasons (by the Four Brethren) for their Protestation entered before the Commission of the General Assembly." This document, which afterwards came to be known as the "First or Extra-judicial Testimony," presented in a polemical or argumentative form those facts in the later history of the Church of Scotland at which we have already glanced; and is of great value with reference to a proper understanding of the grounds of secession. From it we learn that it was *not* one thing only, not even the unpopular "law of patronage" (as has sometimes been carelessly imagined and asserted), that induced Erskine and his friends to leave the church of their fathers; but an accumulation of grievances that in their eyes had become insupportable. In short, the Secession Church had a *religious*, and not a *political* origin. What the "four brethren" sought was the vindication of what they held to be evangelical truth, much more than of the mere right of "popular election." So much popular indignation was excited by the deposition of the "four brethren," that it was thought desirable by the majority of the "Moderate party" to make certain concessions to the "Evangelicals," or "Marrow party," lest the spirit of insurrection should grow, and perhaps overturn the Establishment. Accordingly, the General Assembly of 1784 passed some measures distinctly favorable to the latter party, and curiously contrasting with their former procedure; and finally, on the last day of the sittings, empowered the "synod of Perth and Stirling" to remove the censures from the four brethren, and to restore them to their respective charges. This was done; and to shew how far their new-born cordially could go, the synod proceeded, in Mr Erskine's absence, to elect him "moderator;" but Mr Erskine declined to be "reposed," and gave his reasons in a letter to the Stirling presbytery, and in a pamphlet subsequently published. In December 1786 appeared the pamphlet entitled "An Act, Declaration, and Testimony for the Doctrine, Worship, Discipline, and Government of the Church of Scotland," commonly known as the "Judicial Testimony," which is a sort of survey of the whole ecclesiastical history of Scotland from the Reformation downwards, in which all the "instances of detection and relapse are marked and judicially condemned." In 1787, the Rev. Thomas Mair of Orwell, the Rev. Ralph Erskine of Dunfermline, the Rev. Thomas Mair of Abbotshall, and the Rev. James Thomson of Burntisland, joined the original "four." The church authorities, filled with anger and alarm, now resolved to proceed to extremities against the seceders. In 1788, the "commission," obeying the injunctions of the Assembly of that year, libelled the "Eight Brethren," and summoned them to appear before the Assembly of 1789, which they did—having, however, first drawn up and passed an act entitled a "Declinature," in which they disclaimed the authority of the Established courts. One final effort was made by the Assembly to bring them back to the bosom of the church, but it failed—the "brethren" adhering strictly to all their former protestations and testimonies; and after a "year of grace," the General Assembly of 1740 solemnly pronounced their deposition, and the connection between Erskine and the church of his fathers was for ever at an end.

It is not necessary to describe minutely the gradual extension of the "Secession movement" among the people of Scotland, but we may mention that in spite of the frequent refusal of sites for churches, and other modes of persecution, the cause abundantly prospered; and after a few years, the "Secession Church" came to be recognised as a really important body, both from the number of its congregations, and the grave, serious, and solid character of its members.

In 1747, a rupture or "breach" took place in the new body on the question of the burghs-outh, some affirming that this outh could not be taken by any consistent

Seceder, and others insisting that it could, and that the question regarding it ought to be matter of mutual forbearance. The party condemning the religious clause in the burghers-oath formed the *General Associate Synod*, or popularly, the *Anti-burgher Synod*; the party tolerating it, the *Associate or Burgher Synod*. Subsequently, a second split occurred in each of these, and two other trivial denominations were formed, the one assuming the designation of the "Constitutional Associate Presbytery," or "Old Light Anti-burghers" (1806); and the other, the designation of the "Original Burgher Presbytery," or "Old Light Burghers" (1799). After holding aloof from each other for more than 70 years, the Burghers and Anti-burghers began to approximate once more, and finally, on the 8th September 1830, in Brieto Street meeting-house, Edinburgh, the synods of the two long separated branches of the Secession were solemnly re-united. At the date of the "breach" (1747), the number of Secession congregations was 32; when the reunion took place, it had increased to 262. Henceforward, the history of the Secession Church exhibits a course of uninterrupted prosperity. A certain change, however, now begins to shew itself in the character and spirit of the denomination. Hitherto, Seceders had worn a sort of *old-world look*, if we may use these words respectfully; their thoughts and interests in matters ecclesiastical centred round bygone times and events; their very language, like their sentiments, was archaic, and fell coldly upon all but the devotedest ears. Now, however, the wants of the modern world made themselves felt even in the narrow circles of Scotch dissent. In a word, they came under the liberalising influences of the new-born enthusiasm for foreign missions, and started "stations" in Canada, Jamaica, Trinidad, Calabar, &c. So vigorously was this important branch of Christian work carried on, that in 1847, at the period of the union of the Secession and Relief Churches, the former was found to be supporting a staff of more than 60 missionaries in different parts of the world. Further, the Secession Church began to assume an attitude more distinctly antagonistic to the Establishment. Though it has never formally avowed the *voluntary principle* (see VOLUNTARIANISM), yet the fact that it has maintained itself *ab initio* by voluntary effort, has had the effect of determining the great majority of the pastors and people to adopt this principle. A variety of circumstances, partly political and partly ecclesiastical, led to a great controversy between leading divines of the Establishment and of the Secession, known as the *Voluntary Controversy* (1829—1834), which served to strengthen the voluntarism of the Seceders, and brought them more closely into connection with the Relief Church (see below), whose theoretical voluntarism was perhaps still more pronounced. Next followed the famous *Atonement Controversy*, in which the Secession Church signalled itself by an adherence to the liberal evangelical theology of the Marrow, and on this vital point also it had the sympathy and support of the Relief body. The desire for union between the two denominations now became stronger than ever. Committees were appointed, and conferences held; and at length on the 18th May 1847, in Tausfield Hall, Edinburgh, the union of the Secession and Relief was formally accomplished, and the two churches abandoning the names by which they had hitherto been known, formed themselves into one body under the designation of the UNITED PRESBYTERIAN CHURCH.

We now revert to the RELIEF CHURCH, whose history and fortunes we shall briefly narrate. After the expulsion of Erskine and his friends from the Church of Scotland, the assemblies (packed with "Court of Session elders") became more determinedly "moderate" than ever. The split that occurred among the Seceders in 1747 convinced them that they had now little to fear from the aggressive zeal of their opponents, who had taken to quarrelling among themselves; and, desiring to stand well with government for various reasons, they boldly resolved to deprive the people of all right to elect, or in any way to interfere with the election of, ministers. Never were forced settlements more shameless than about this period; but it has been well remarked, "there is a point at which oppression becomes intolerable; and to a religious people, no oppression is half so galling as that which is spiritual." Relief was felt to be a necessity, and relief came in the person of the Rev. Thomas Gillespie, minister of the parish of Carnock, near Dunfermline. The circumstances which brought him into collision with the General Assembly were these: In 1749, the Rev. Andrew Richardson was presented to the parish of Inverkeithing by the patron, Captain Philip Anstruther; but the presentation proved

so extremely unpopular that the presbytery of Danfermline refused to proceed with it. In 1780, the case came before that high-handed body, the "Commission of the Assembly," who ordered the presbytery to proceed at once to induct Mr Richardson. This mandate they firmly refused to obey; and when, after much discussion, the affair again came before the Commission in March 1782, it was resolved to transfer the onus of the unpopular settlement from the shoulders of the presbytery of Danfermline to those of the synod of Fife. This compromise did not satisfy the out-and-out Moderates in the Church of Scotland. It was therefore resolved to make an example of the presbytery of Danfermline at the ensuing Assembly. On 16th May, the "Inverkelthing case" came on, and after a brief but animated debate, the conduct of the "Commission" was condemned by the Assembly without coming to a vote; the presbytery of Danfermline was ordered to induct Mr Richardson on Thursday the 21st, and on the day following to appear at the bar of the Assembly. The presbytery did not meet on Thursday—at least a *quorum* did not—and Mr Richardson was consequently not inducted. On Friday, six ministers of the presbytery—Robert Stark, David Hunter, Thomas Gillespie, Alexander Daling, Thomas Fernie, and John Spence—banded in a "representation," explaining why they could not obey the commands of the supreme court. They were warned by the moderator of the danger in which they stood, and were finally informed that if they remained obdurate, one of them should be deposed. Next day, they were called in *stingly*. Stark, Fernie, and Hunter all wavered and shifted their ground a little; Daling and Spence said nothing; but Gillespie was ready with a second "representation." This was enough. Gillespie was fixed on as the most suitable sacrifice, and almost without trial, without a libel or any formal process whatever, he was arraigned, cast, condemned, and deposed. The majority of the General Assembly, corrupt as its composition undoubtedly was, seems to have shrunk from active participation in the deed. Out of 168 members present, only 56 ventured to vote, and these, it must be remarked, were mainly lawyers!

The *Relief Church*, it will thus be seen, was founded simply on an assertion of the right of congregations to elect their own ministers. In 1788, Mr Thomas Boston, junior, minister of Jedburgh, and son of the great Boston, threw in his lot with Gillespie; in 1761, the congregation of Collingburgh, in Fife, did the same. The Relief had now got a footing, and steadily increased. "Societies" (as in the case of the Seceders) sprang up everywhere, which were gradually formed into congregations, and obtained ministers from the Establishment, the Secession, the Reformed Presbytery, and the English Presbyterians; nevertheless, they had long to sustain a severe fire of attack from the Seceders and Reformed Presbyterians, on account of their firm adherence to the latitudinarian principle of "free communion," i.e., of holding Christian fellowship at the Lord's table with other denominations. It is unnecessary to prosecute the history of the Relief further than to state that at the union in 1847 it numbered 118 congregations, while the Secession numbered 884 congregations; so that the UNITED PRESBYTERIAN CHURCH commenced with 407 churches, and a membership estimated at more than 140,000.

UNITED PRESBYTERIAN CHURCH.—The career of this church as a corporate body has been one of uninterrupted prosperity, and scarcely more is necessary than to indicate its present attitude and condition. In point of doctrine, it adheres (like all the other Presbyterian churches of Scotland) to the Westminster Confession of Faith, and the Larger and Shorter Catechisms, "it being always understood that we do not approve of anything in these documents which teaches, or may be supposed to teach, compulsory, or persecuting and intolerant principles in religion,"—a qualification supposed to refer more particularly to the 23d chapter of the Confession of Faith. Its form of church government is Presbyterian; but, unlike the Established and Free Churches, it has no intermediate course between presbyteries and the supreme court, the latter of which it does not call a General Assembly, but only a Synod; though, in point of fact, it partakes more of the nature of a "General" Assembly than the bodies known by that name, since it is really an assembly of the whole clergy of the denomination, with one elder from each kirk-session. It has a Theological Hall and Library in Edinburgh, and a staff of professors. The United Presbyterian Church is also at present, not only in *practice*, but also in *theory*, a voluntary church. The voluntary principle, it is true, is not formally laid down in any portion of her standards or "Basis of Union;" but a long experience of prac-

tical voluntarism has finally led, one may almost say, the whole body of United Presbyterians to the conviction that the interests of Christianity are best served by the total separation of the church from the state. Although inferior in point of wealth to the Established and Free Churches, the United Presbyterian Church has honorably distinguished itself by its general liberality and occasional munificence.

In the year 1875 about 100 congregations of the U. P. Church situated in England were transferred by the mother church in Scotland to the "Presbyterian Church in England" (q. v.). Since the separation of its English branch the U. P. Church still counts about 690 congregations and over 173,000 members. Protracted negotiation for union between the U. P. and Free Churches have been without result.

UNITED PROVINCES. See NETHERLANDS.

UNITED STATES OF AMERICA, a federal republic, composed of 38 sovereigns and independent states, and 8 organized territories, and a federal district, occupies a central portion of the continent of North America, from lat. 24° 20' to 49° u., long. 60° 50' to 134° 30' w., bounded n. by the British possessions of North America, from which it is partly separated by Lakes Superior, Huron, St. Clair, Erie, and Ontario, and the St. Clair, Detroit, Niagara, and St. Lawrence Rivers; e. by New Brunswick, the Atlantic Ocean, and Gulf of Mexico; s. by the Gulf of Mexico and Mexico; w. by the Pacific Ocean. Its greatest length, from the Atlantic to the Pacific, is 2760 miles; greatest breadth, from Maine to Florida, 1600; northern or British frontier, 3850 miles; Mexican, 1500 miles; ocean coast, including the larger indentations, 12,609 miles, of which 6681 are on the Atlantic, 3461 on the Gulf of Mexico, and 2461 on the Pacific. The territory of Alaska, long known as Russian America, between lat. 59° and 71° 27' u., and long. 130° 25', and 187° 36' w., now belongs to the United States.

The total area of the U. S. is 3,603,844 sq. m., or 2,366,460,160 acres, obtained by successive annexations of territory. In 1783, the U. S. had an area of only 820,650 sq. m.; by the purchase of Louisiana from France in 1803, it acquired 980,928; by the cession of Florida by Spain in 1819, 50,270; by the annexation of Texas in 1846, 247,600; by the Oregon Treaty with Great Britain in 1846, 280,425; by the Mexican treaties, 677,200; and by the purchase of Alaska from Russia in 1867, 577,390 square miles.

The 38 states composing the Federal Republic, each having its constitution, legislature, executive, and judiciary, and represented in the Federal Congress by two senators, and from 1 to 33 representatives, according to its population, are the following: Six eastern or New England—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut; four middle—New York, New Jersey, Pennsylvania, Delaware; eleven southern—Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas; seventeen western—Arkansas, Tennessee, Kentucky, Ohio, Indiana, Illinois, Missouri, Michigan, Wisconsin, Iowa, Minnesota, Kansas, California, Oregon, Nebraska, Nevada, and Colorado. The eight organized territories, governed by the Federal Congress, with governors and judiciary appointed by the President of the U. S., but having a local legislature, and sending a delegate without a vote to Congress, are New Mexico, Utah, Washington, Dakota, Arizona, Idaho, Montana, Wyoming. There is also the Indian Territory, a reserve for Indian tribes, removed from the east of the Mississippi River, governed by the Indians, under the protection of the U. S.; the district of Columbia (60 sq. m.), ceded by Maryland, including Washington, the Federal capital, governed by Congress; and Alaska, under military rule.

All these states and territories are described separately. Arizona, which includes the western portion of New Mexico, organized as a territory in 1858; and Idaho, taken from the southern portion of Washington Territory, east of Oregon, also constituted a territory in 1863, are noticed elsewhere.

The table following gives the date of the admission of the states to the Union, and the organisation of territories, their areas in sq. m., and progressive population.

The states in the table designated as having been admitted 1787 to 1790, were the original 13 states, which at these dates adopted the Federal constitution. A part of the original Virginia now forms the state of West Virginia. The states in which slavery existed in 1860 are in *italics*. By an amendment of the constitution, slavery

was abolished December 18, 1865. These numbers do not include the Indians or aborigines of the country, who are under the protection of the government, and who sparsely people the Indian reserves and unsettled Territories. In 1870, there were estimated to be of Indians in the Indian Territory, 59,367; New York, 5144; California, 29,025; Oregon and Washington Territories, 26,074; Utah, Nebraska, Kansas, Idaho, Montana, Dakota, Nevada, Colorado, Wyoming, New Mexico, and Arizona, 160,822; Alaska, 70,000; Michigan, Minnesota, and Wisconsin, 24,462; forming, with small numbers in other states, an aggregate of 833,712. Total estimated number in 1881, 246,417.

No country has been peopled by such a variety of races. New England was settled by English Puritans, and a few Scottish and Welsh; New York, by Dutch; Pennsylvania, by Quakers and Germans; Maryland, by English Roman Catholics; Delaware and New Jersey, by Dutch and Swedes; Virginia, by English cavaliers; the Carolinas, in part by French Huguenots; Louisiana, by French; Florida, Texas, and California, by Spanish; Utah, by Mormons, chiefly from England, Wales, and Denmark. Immigration from Ireland, Germany, England, Scotland, France, Switzerland, Sweden, has been large and progressive. In the year ending June 30, 1881, the total number of immigrants that arrived in the U. S. was 669,431. Of these there came from Great Britain and Ireland, 153,718; Germany, 210,483; China, 11,890. In 1881-2, the number of immigrants was 788,962. From 1820 to 1879, the emigration from Great Britain and Ireland to the U. S. was 4,698,098. The Germans and Irish, and their descendants, in the U. S., probably form one-third of the entire population.

Physical Character.—Though occupying the central portion of a continent, more than two-thirds of the frontiers of the U. S. are shores of lakes and oceans, with numerous bays and sounds, rivers and lakes. On the Atlantic coast are—Passamaquoddy Bay, Penobscot Bay, Casco Bay, Massachusetts Bay, Long Island Sound, New York Bay, Delaware Bay, Chesapeake Bay, Albemarle and Pamlico Sounds, &c.; on the Gulf of Mexico—Tampa Bay, Apalachicola Bay, Pensacola Bay, Mobile Bay, Atchafalaya Bay, Galveston Bay, Matagorda Bay, Corpus Christi Bay, &c.; and on the Pacific—the Channel of St Barbara, Bay of Monterey, San Francisco Bay, Humboldt Harbor, Strait of Juan de Fuca, Puget's Sound, &c., and the bays and sounds of Alaska. The principal lakes, besides those divided with British America, are Lake Champlain, Lake Michigan, Great Salt Lake, Pyramid Lake, Mono Lake, Lake Tulare, and many beautiful clusters of smaller lakes in Maine, New York, Minnesota, &c.

The rivers of the U. S. may be classed in four divisions: 1. The Mississippi and its branches (q. v.); 2. The rivers emptying into the Atlantic or its bays and sounds—the St Croix, Penobscot, Kennebec, Merrimac, Connecticut, Hudson, Delaware, Susquehanna, Potomac, James, Roanoke, Neuse, Cape Fear, Pedee, Santee, Savannah, Altamaha, St Johns, &c.; 3. Those, besides the Mississippi, emptying into the Gulf of Mexico—the Chattahoochee, Alabama, Tombigbee, Pearl, Sabine, Trinity, Brazos, Colorado, Nueces, and Rio Grande; 4. Those emptying into the Pacific—the Oregon or Columbia, Sacramento, San Joaquin, Colorado, &c. Besides these, there are many small rivers emptying into the great lakes, and finding their outlet through the St Lawrence; and the rivers which empty into the salt lakes of the great interior basin of Utah.

The chief mountains of America are those which belong to the great eastern chain of the Alleghanies (see APPALACHIANS) and the Rocky Mountains (q. v.).—The geology of the U. S. will be found described under the titles NORTH AMERICA (*Geology*), APPALACHIANS, ROCKY MOUNTAINS, and the several states and territories.—The soil is of every variety, from the sterile deserts of the great western plains and Utah, to the inexhaustible fertility of the bottom-lands of the Mississippi Valley, where heavy crops of maize have grown for fifty successive years without manuring. The St Lawrence basin is an elevated calcareous plain, fertile and well wooded. The Atlantic slope from Maine to New Jersey, east of the Hudson, is hilly, and best adapted for grazing; more southerly, the coast-belt is low, sandy, in places swampy, with pine-barrens, the inland region fertile, and among the best in the country. The Mississippi Valley is generally level, and prairie-land of unsurpassed fertility, with a rich mould, in places 25 feet deep. North-west the country rises to a high and sterile region, extending from 200 to 400 miles from the base of the Rocky Mountains.

OF UNIVERSAL KNOWLEDGE.

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United

States.	Admitted.	Area in Sq. Miles.	Pop. in 1800.	Pop. in 1820.	Pop. in 1860.	Pop. in 1880.
EASTERN—						
Maine.....	1820	35,000	151,719	296,919	628,279	648,086
New Hampshire.....	1788	9,360	188,762	244,022	326,073	346,991
Vermont.....	1791	10,212	154,465	235,966	315,066	332,266
Massachusetts.....	1788	7,800	423,845	523,159	1,231,066	1,763,065
Rhode Island.....	1790	1,306	69,122	83,015	174,680	273,551
Connecticut.....	1788	4,750	251,004	276,143	460,147	622,700
MIDDLE—						
New York.....	1788	47,000	589,051	1,372,111	3,880,735	5,062,871
New Jersey.....	1787	8,320	211,149	277,426	672,085	1,131,116
Pennsylvania.....	1787	46,000	602,365	1,047,507	2,906,215	4,282,891
Delaware.....	1787	2,120	64,273	72,749	112,216	146,608
SOUTHERN—						
Maryland.....	1788	11,194	341,548	407,350	687,049	984,943
Virginia.....	1788	36,348	680,200	1,065,116	1,566,318	1,512,565
West Virginia.....	1862	23,000	.....	.....	.....	618,457
North Carolina.....	1789	50,704	478,103	638,929	992,622	1,899,750
South Carolina.....	1788	34,000	845,591	502,741	708,708	695,577
Georgia.....	1788	58,000	162,686	340,985	1,067,286	1,542,180
Florida.....	1845	59,268	.....	.....	140,424	269,493
Alabama.....	1819	50,722	.....	197,901	964,201	1,262,505
Mississippi.....	1817	47,156	8,850	75,448	791,305	1,131,597
Louisiana.....	1812	41,846	.....	152,923	708,002	859,946
Texas.....	1845	274,356	.....	.....	604,215	1,591,749
WESTERN—						
Arkansas.....	1836	52,198	.....	14,255	495,450	802,525
Tennessee.....	1796	45,600	105,602	422,771	1,109,801	1,542,359
Kentucky.....	1792	37,680	220,995	564,135	1,155,684	1,648,690
Ohio.....	1802	39,964	45,365	581,295	2,329,511	3,198,062
Michigan.....	1837	56,451	.....	8,765	749,118	1,636,937
Indiana.....	1816	33,809	5,561	147,173	1,350,428	1,978,301
Illinois.....	1818	55,410	.....	55,162	1,711,951	3,077,871
Wisconsin.....	1848	53,924	.....	.....	775,881	1,315,497
Iowa.....	1846	55,045	.....	.....	674,913	1,624,615
Minnesota.....	1857	83,531	.....	.....	172,023	780,773
Missouri.....	1821	65,350	.....	.....	1,182,012	2,168,380
California.....	1850	188,981	.....	.....	379,994	864,694
Oregon.....	1859	95,274	.....	.....	52,465	174,768
Kansas.....	1861	81,318	.....	.....	107,206	696,086
Nebraska.....	1867	75,995	.....	.....	28,841	452,402
Nevada.....	1864	104,125	.....	.....	6,857	62,266
Colorado.....	1875	104,500	.....	.....	24,277	194,827
District of Columbia (established).....	1790	64	14,068	33,069	76,060	177,624
TERRITORIES—						
New Mexico.....	1860	121,201	.....	.....	93,516	119,656
Utah.....	1850	84,476	.....	.....	40,273	143,963
Wyoming.....	1866	97,663	.....	.....	.....	20,769
Dakota.....	1861	150,022	.....	.....	4,637	135,177
Montana.....	1864	148,776	.....	.....	.....	39,159
Idaho.....	1863	86,394	.....	.....	.....	32,610
Washington.....	1853	69,994	.....	.....	11,594	75,116
Arizona.....	1863	113,916	.....	.....	.....	40,440
Alaska.....	1867	577,390	.....	.....	.....	.....
Indian Territory.....	.....	68,991	.....	.....	.....	.....
Ag. of States and Ter.	.....	3,608,894	5,809,427	9,623,922	31,443,321	50,185,793
Colored Population....	.....	.....	1,002,037	1,771,656	4,441,890	6,580,793

The Texas slope has rich bottom-lands on the coast, a fine rolling fertile country, rising to a high plateau, dry and sterile, except in the river-bottoms. The Pacific slope is generally sterile, except the great valleys between the mountain-ranges, and bordering the rivers, which are of great fertility. Utah, with the exception of a few fertile spots, is a desolate untimbered region of salt lakes and land saturated with alkaline substances. The country east of the Mississippi, except the prairies of Illinois and Indiana, was, at its settlement, heavily wooded, and there are still vast forests of valuable timber—beech, birch, maple, oak, pine, hemlock, spruce, walnut, hickory, ash, elm, &c.; and in the south, live oak, water oak, magnolia, palmetto, tulip-tree, cypress, cotton-wood, cane, &c. West of the 97th meridian stretches a vast region of almost treeless prairies; forests again occur in the Rocky Mountains, and California, Oregon, and Washington Territory have the largest timber in the world. The flora and fauna will be found under the head *NORTH AMERICA (Botany, Zoology)*, and the several states.

Climate.—For a particular account of the climate of the U. S., we refer to the articles *RAIN* and *TERRESTRIAL TEMPERATURE*. It is remarkable for wide transitions of cold and heat, rain and drought, except in the peninsula of Florida, where the temperature varies but 12° F., and Western Oregon and Washington Territory, where the climate is like that of England. With few exceptions, the summers are hot, both north and south, the thermometer rising at times to 110° F., and along the northern range of states sinking to 20°, and even sometimes as low as -40°. The whole Atlantic coast has a winter temperature 10° lower than that of Western Europe in the same latitude. Thus, at New York, in the latitude of Madrid, the Hudson River is frozen, and the harbor at times filled with floating ice. The causes modifying the climates of the different portions of the states chiefly arise out of the physical features; of which the Rocky Mountains, the Gulf of Mexico, the Atlantic, and the lake system in the north are the most prominent. On the west, from the shores of the Pacific to the Cascade Mountains, one of the most important ranges of mountains in America, the climate resembles that of Great Britain more closely than that of any other country in the world, being mild and humid, with frequent showers at all seasons. But the great valley lying between the Cascade and the Rocky Mountains is almost entirely a rainless district, because the westerly winds are drained of their moisture in crossing the Cascade Mountains before arriving there. In winter, it is covered with snow, but in summer is dry and arid. Owing, however, to the copious streams poured down from the melting snow, it presents abundant facilities for irrigation, so that its capabilities and resources are great, if they were properly developed. The country east of the Rocky Mountains depends for its rain on the Gulf of Mexico; and the rainfall there is distributed most in the low plains, and least on the plateaux and mountains. Hence over this extensive district southerly winds are warm and moist, and westerly and northerly dry and cold. The result is rapid alternations of temperature, such as are never experienced in Western Europe, the temperature having frequently a range in the course of a day of 50° or 60°. In the New England states, the northerly and easterly winds are cold, moist, and chilly, accompanied with frequent fogs; otherwise the climate resembles that of Great Britain. The climate of the states surrounding the great lakes in the north is mild and moist in summer as compared with the other Northern states; but in winter, when the lakes are frozen over, a degree of cold is experienced greater, absolutely and relatively, than anywhere else in the states. This excessive cold is caused by the country being exposed in the north to the full sweep of the Polar current from the north; but more particularly to its low-lying situation, thus forming, as it were, a vast basin into which is poured from all sides the cold, and therefore heavy, currents of air chilled by terrestrial radiation during the winter season.—The health of the U. S. varies with climate, elevation, &c. Swamps and river-bottoms in some regions, especially the more fertile, are malarious. The rice-swamps of Georgia and South Carolina are fatal to whites, but not to negroes. In vast tracts of new country, even the rolling and hilly, the disturbance of the soil causes intermittent fevers. Diseases of the lungs prevail in the northern and middle states, bilious fevers in the southern; in the western, intermittent and remittent bilious. In 1830, the average mortality was 1 in 72, varying rather widely in different regions, modified not only by climate, but by the presence of large towns, and by immigration and emigration. The deaths in Vermont, a rural New England

state, were 1 per cent.; in Florida, the most southerly, though increased by consumptive patients from the north, 1.66; Georgia, 1.09; Alabama, 1.18; Maine and Indiana, 1.80; Ohio and Texas, 1.46; Missouri, 1.50; Massachusetts, with numerous manufacturing towns, 1.96; Louisiana, with yellow fever, and a large floating unacclimated population, 2.81. Probably, no portion of the world is more salubrious than Vermont, and the eastern slope of the Alleghanies, Florida, the upper country around the Gulf of Mexico, the head-waters of the Mississippi, California and Oregon.

Mineralogy.—The U. S. are rich in mineral productions. Coal is found in every state except Maine, New Hampshire, Vermont, New Jersey, Delaware, South Carolina, Louisiana, Mississippi, Minnesota, Wisconsin, and Nevada. The area of the coal-measures is estimated at 300,000 sq. miles. The whole extent of the coal area in the U. S. has been divided into four principal coal-fields or tracts—viz., the Great Central Alleghanian or Appalachian coal-field, extending from Tuscaloosa in Alabama, through Eastern Tennessee and Kentucky, Western Virginia, Maryland, Ohio, Pennsylvania, and reappearing in New Brunswick and Nova Scotia. This field has been computed to cover within the U. S. an area of 50,000 to 60,000 sq. m., of which about 40,000 sq. m. are considered workable area. It is subdivided into eight minor divisions, productive of bituminous coal. The second coal-field occupies the greater part of Illinois and Indiana, and in extent is nearly equal to the first. A third field covers a large portion of Missouri; and the fourth the greater part of the state of Michigan. The Chesterfield bituminous coal-field, a detached district of small area near Richmond, Virginia, contains the oldest-worked collieries in America, and for many years furnished the only supply of coal for the sea-board towns. The production of 1880 was 70,481,736 tons, three-fourths of which were produced in Pennsylvania alone. Connected with the coal-fields are the petroleum springs, which form a source of great wealth to many localities. The exports of petroleum to Britain alone, in 1875, amounted to £770,488. See NAPHTHA. Beds of rich marl are found in several of the eastern states, and in many, nitrates and carbonates of soda and potassia, gypsum, and marble of great variety and some of rare beauty. Iron is found everywhere, from the pure metal in mountain masses, to bog-ore; and in many places in close proximity to coal. Lead exists in rich deposits in Missouri, Arkansas, Illinois, and Iowa. Copper is found in several states, and in great quantities of ores of 71 to 90 per cent. on the borders of Lake Superior. Zinc exists in considerable quantities in New Jersey and Pennsylvania. Tin has been found in Maine and California. Silver is found in lead and copper, and in rich silver mines in New Mexico, Arizona, California, Utah, and Nevada. Gold is found in small quantities in the eastern states; in larger deposits in Virginia, North and South Carolina, and Georgia; and in great quantities in California, Oregon, Colorado, Nevada, and Washington, Arizona, New Mexico, and Montana Territories. There are also found platinum in small, and mercury in large quantities in California, osmium and iridium in Oregon, cobalt in North Carolina and Missouri, and nickel in Connecticut and Pennsylvania.

Agriculture.—With an abundance of fertile land, agriculture holds the first place in the national industry. In 1880, 536,081,835 acres were occupied as farms, of which the cultivated land was 284,771,042 acres. According to the agricultural returns for 1880, the acreage of the principal crops was as follows: Hay, 10,009,052; maize or Indian corn, 62,368,504; wheat, 35,430,333; oats, 16,144,593; potatoes, 1,200,912; buck-wheat, 848,389; barley, 1,997,727; tobacco, 638,841; rye, 1,842,233. The other crops were sugar, rice, peas and beans, hemp, flax, &c. The average size of farms, nearly all held by their cultivators in fee-simple, is 134 acres. The quantities of the chief agricultural productions of 1880 were: Indian corn, 1,754,591,676 bushels; wheat, 459,483,187 bushels; oats, 407,858,999 bushels; potatoes, 202,837,232 bushels; barley, 43,997,493 bushels; rye, 19,831,595 bushels; buck-wheat, 459,483,187 bushels; hay, 35,205,712 tons; tobacco, 472,661,157 lbs.; cotton, 5,755,359 bales. In 1881-1882, 3,611,531 acres of the public land were sold for cash, mostly at the ordinary price of one dollar and a quarter an acre; 43,866 acres were bought with military warrants, and 6,348,045 acres were entered under the law of Congress, which gives a homestead after five years' occupation, while upwards of one million and a half were granted to agricultural schools, railways, Indian reservations, or individual states. Vast quantities of land have been impoverished, ex-

hausted, and abandoned; but improved systems of agriculture are promoted by the government, and widely introduced. Wheat and maize are grown in all the states; cotton, south of lat. 37°; cane-sugar, in Louisiana, Texas, and Florida; hemp and tobacco, chiefly between lat. 34° and 40°; rice, in South Carolina and Georgia; figs and oranges flourish in the Gulf States; and peaches, grapes, melons, and other delicious fruits are abundant and in great perfection south of lat. 43°. At the census of the U. S. taken in 1880, there were in the country 10,357,488 horses, 35,925,511 cattle, 35,192,074 sheep, 47,681,700 swine, and 1,812,308 mules and asses.

Manufactures, Commerce, &c.—Manufactures, protected by high duties on foreign importations, have had a rapid development, as will be seen in the accounts of individual states. The census of 1880 gives the following aggregates for the year: Iron and steel 7,235,140 tons; manufactures of cotton, 1005, making goods to the value of \$210,950,383; woolen mills, using 197,524,955 lbs. wool, and producing goods to the value of \$160,606,383; leather in boot and shoes, valued \$196,920,481, curried and tanned, \$185,000,000; flour, \$305,185,712; lumber, \$270,672,065, with large quantities of petroleum, spirits, India-rubber goods, steam-engines and machinery, paper, oilcloth, carriages, sewing-machines, and agricultural implements. The chief manufacturing states are Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and Maryland. The whole number of manufacturing establishments, large and small, in the U. S. in 1880, was 253,852, employing a capital of \$2,790,272,606; using raw material of the value of \$3,396,823,549; and employing the labour of 2,619,635 males and 531,639 females, besides, 181,921 children, and producing manufactures valued at \$5,369,579,191.

The commerce of the U. S., foreign and internal, is in proportion to its agriculture and industry. The exports of the year ending June 30, 1882, amounted to \$776,720,003, or £155,354, of which the chief articles were wheat, flour, cotton, tobacco, pork and ham, butter, cheese, lumber, fish, manufactured goods, oils, gold and silver, &c. The imports were \$743,772,231, or £154,754,448, the principal articles being foreign manufactures, sugar, tea, coffee, wool, iron, and steel, &c. The total number of vessels that entered in the foreign trade in 1874-5 was 27,961, with a tonnage of 11,692,810; cleared 28,238 vessels, of 11,896,507 tons.—Great facilities for internal commerce are given by free trade between all states and territories, and the great extent of navigable rivers, canals, and railways. The Mississippi and its branches afford 20,000 miles of steamboat navigation; and most of the rivers emptying into the Atlantic, Gulf of Mexico, and Pacific, are navigable from 100 to 500 miles; canals unite the waters of the Hudson river, with Lake Champlain, Ontario, and Erie, in New York, the Delaware and Susquehanna rivers in Pennsylvania, the Ohio with Lake Erie in Ohio and Indiana, and the Mississippi with Lake Michigan in Illinois. Other canals make with these an extent of 3500 miles, costing \$100,000,000. Railways extend from the lakes to the Gulf of Mexico, and from the Atlantic to the Pacific, of which there were in operation in January, 1882, 104,825 miles. The number of telegraph offices was 12,068; the total length of lines, 131,000 miles; and of wires, 574,368 miles.

Education and Religion.—The benevolent, literary, and scientific institutions of the U. S. are generally state institutions, accounts of which will be found under the heads of the respective states. The exceptions are the Smithsonian Institute (q. v.), American Association for the Advancement of Science, the National Academy of Sciences, and military and naval academies and hospitals.—In the U. S. are 362 colleges, 143 theological schools, 20 schools of law, 71 of medicine, 26 scientific, great numbers of academies or high schools, and female seminaries. Free common schools are established in nearly all the states, sufficient for universal education, supported by taxes, school funds, and, in all the new states, the reservation of one or two sections of land, of 648 acres each, in every township. In 1874, there were 73 public libraries containing 25,000 volumes or more, 9 of which had upwards of 100,000 volumes, and a great many lyceums, literary societies, and courses of popular lectures. The press is very active. In 1880, there were 11314 periodical publications—971 daily, 246 semi-weekly or tri-weekly, 663 weekly, 1342 monthly and semi-monthly, and 123 quarterly, having an aggregate circulation per issue of 31,177,924.

Religion is free from any interference of either the Federal or state governments, and all denominations exist in entire freedom upon the voluntary principle. There were, according to the census of 1870, 68,082 churches or places of worship in the U. S., giving 562 seats to each 1000 of population. The Roman Catholics possess 2806 edifices, with 1,900,514 sittings. Of the twenty or more denominations of Protestants, the most numerous are the Methodists, possessing 21,387 edifices, with 6,528,200 sittings; after whom come Baptists, having 18,963 edifices, 4,860,135 sittings; Presbyterians, 7071 edifices, 2,608,244 sittings; Congregationalists, 2716 edifices, 1,117,212 sittings; Episcopalians, 2601 edifices, 991,061 sittings; Christian Connection, 2623 edifices, 866,602 sittings; Lutherans, 2776 edifices, 977,882 sittings; Reformed Churches, 1612 edifices, 658,928 sittings; United Brethren in Christ, 937 edifices, 265,025 sittings, &c. The Jews have 153 edifices, with 72,265 sittings.

Constitution, Government, &c.—The government of the U. S. is one of limited and specific powers; strictly defined by a written constitution, framed by a convention of the states in 1787, which went into operation after being ratified by the thirteen original states in 1789, by which instrument the several states, having their independent republican governments, conferred upon a Federal Congress, executive, or President, and judiciary, such powers as were necessary to "form a more perfect union, establish justice, insure domestic tranquillity, provide for the common defence, and secure the blessings of liberty." The legislative powers granted to the Federal government are vested in a Congress of the U. S., consisting of a Senate of two senators from each state, chosen by the legislature thereof; and a House of Representatives, consisting of one or more members from each state, elected by the people in equal electoral districts; so that the states, large and small, have each 2 votes in the senate, and from 1 to 33 (in 1832, New York had 40 members) in the House of Representatives, which consists of 293 members, or 1 to 171,180 of population. The senator must be 30 years old, and is chosen for 6 years; the representative, 25 years old, and elected for two years. Senators and representatives, according to an act of Congress, are paid \$5,000 per annum, with travelling expenses. The Senate is presided over by the Vice-president; and is a high court for trial of cases of impeachment. It also confirms the appointments of the President, and ratifies treaties made with foreign powers. Revenue bills originate in the House of Representatives. Bills passed by both Houses, within the limits of their constitutional powers, become laws, on receiving the sanction of the President; or, if returned with his veto, may be passed over it by two-thirds of both Houses.

By the constitution, the states granted to Congress power "to lay and collect taxes, duties, imports, and excises, to pay the debts, and provide for the common defence and general welfare of the United States;" to borrow money; to regulate commerce; to establish uniform naturalisation and bankruptcy laws; to coin money, and fix the standards of weights and measures, and punish counterfeiting; to establish post-offices and post-roads; to secure patents and copyrights; punish piracies; declare war; raise armies and navy; to call out the militia, reserving to the states to appoint their officers; and to govern the district of Columbia, and all places purchased for forts, arsenals, &c., with the consent of the state legislatures. All powers not expressly granted are reserved to the states or the people; but the states, though sovereign and independent under the constitution, with all powers of local legislation, eminent domain (i. e., absolute possession of the soil), and power of life and death, with which neither President nor Congress can interfere, cannot make treaties, coin money, levy duties on imports, or exercise the powers granted to Congress.

The executive of the Federal government is a President, chosen by an electoral college, equal in number to the senators and representatives, elected by the people of the states. He must be a native of the U. S.; 35 years old, and is elected for a term of four years, and may be re-elected without limit. His salary is \$50,000 a year. The Vice-president, who, in case of the death of the President, succeeds him, is President of the senate. If he should die after becoming President, his successor would be chosen by Congress. The President, by and with the consent of the Senate, appoints a cabinet, consisting of the Secretaries of State and Foreign Affairs, Treasury, War, Navy, Interior, the Postmaster-general, and Attorney-general. These officers have salaries of \$8,000 a year, have no seats in Congress, and are solely responsible to the President, who also appoints directly, or through his

subordinates, the officers of the army and navy—of which he is commander-in-chief—the justices of the Federal judiciary, revenue-officers, post-masters, &c.—in all about 100,000 persons.

The judiciary consists of a supreme court, with one chief-justice and eight assistant justices, appointed by the President for life, and district judges in each district. The supreme court has jurisdiction in all cases arising under the constitution, laws, and treaties of the U. S.; causes affecting ambassadors and consuls, of admiralty and jurisdiction; controversies to which the U. S. is a party, or between a state and the citizens of another state, citizens of different states, citizens and foreign states. It has original jurisdiction in state cases, or those affecting ambassadors or consuls—in others, appellate. A person may be tried for treason, both against the Federal government, and against the state of which he is a citizen. The President can relieve or pardon a person condemned by a Federal court; but has no power to interfere with the judgments of state tribunals. Besides the supreme court, there are U. S. district courts, with judges, district attorneys, and marshals, in districts comprising part or whole of the several states. The citizens of each state are entitled to all privileges and immunities of the several states. Criminals escaping from one state to another are given up for trial on demand of the executive; and the constitution declared, before the rebellion, that "no person held to service or labor in one state under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labor, but shall be delivered up on claim of the party to whom such service or labor may be due." The constitution may be amended by a convention called at the request of two-thirds of the states; or amendments may be proposed by a vote of two-thirds of Congress, and ratified by three-fourths of the states; but "no state, without its consent, shall be deprived of its equal suffrage in the Senate."

The President, either directly, or through the Secretary of State and Foreign Affairs, appoints ministers, consuls, and consular agents to foreign countries. There are 12 envoys-extraordinary and ministers-plenipotentiary, receiving from \$17,500 to \$10,000 salary; 4 commissioners at \$7500; 19 ministers-resident, \$7500 to \$4000. The consuls are paid by fees or salaries from \$500 to \$7500.

The Secretary of the Treasury has charge of the treasury, finance, and revenue of the country, with its custom-houses and revenue-office service.

Revenue, Expenditure, &c.—The following table gives the expenditures (excepting interest on debt), and the debt of the U. S., for 20 different years:

Year.	Civil List.	Military.*	Naval.	Total Expenses.	Debt.
	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.
1854	25,907,372	14,342,684	10,768,192	51,018,248	44,975,456
1855	24,183,487	18,900,565	13,281,341	56,365,393	39,969,731
1856	25,274,331	20,821,034	14,077,047	60,172,409	30,903,910
1857	27,531,922	24,619,049	12,726,857	64,877,828	25,465,155
1858	26,387,822	31,537,307	13,976,001	71,901,130	44,910,778
1859	25,787,810	27,997,794	14,712,610	68,498,214	58,754,669
1860	31,925,557	16,409,767	11,513,150	59,848,474	64,769,703
1861	26,947,325	22,981,150	12,428,577	62,357,053	90,867,828
1862	24,511,476	394,368,707	42,674,569	461,554,752	511,826,274
1863	27,470,448	599,298,000	63,211,105	690,080,153	1,098,793,181
1864	35,033,498	690,791,843	85,733,292	811,558,632	1,740,690,489
1872	96,579,889	35,372,157	21,249,810	153,201,856	2,253,251,328
1873	108,911,574	41,120,645	21,197,626	171,229,845	2,237,813,048
1876	107,822,614	38,070,888	18,936,309	164,837,813	2,180,395,067
1877	89,792,837	37,062,735	14,959,935	141,815,507	2,205,301,392
1878	84,944,004	32,154,147	17,365,301	134,463,452	2,256,205,892
1879	106,069,148	40,495,860	15,125,126	161,619,934	2,345,495,072
1880	120,231,481	38,116,916	13,536,985	171,885,368	2,120,415,370
1881	122,050,013	40,466,480	15,686,672	178,204,164	2,069,013,569
1882	128,301,692	43,570,494	15,032,046	186,905,228	1,918,312,994

The great decrease of the total expenditure in the year 1872, compared with 1864, is accounted for by the decrease in naval and military expenses upon the cessation of the war in 1865.

The revenue of the U. S., up to the War of Secession, 1861, was drawn almost wholly from the sale of public lands and duties on imports. In 1850, the revenue from customs was \$39,688,886; from lands, &c., \$3,707,112—total, \$43,375,798. In 1860, the revenue from customs was \$53,187,511; lands, &c., \$4,877,691—total, \$58,064,906. The cost of the war compelled the government to add to these resources a system of internal revenue or direct taxation, consisting of stamps, licenses, excise, income tax, &c., by which the revenues were increased in 1865 to \$309,510,983. The revenue for the year 1861-2 amounted to \$403,585,380; the principal items being customs, \$320,410,730, internal revenue, \$146,407,585, and sales of public lands \$4,763,140. The expenditure was \$357,968,438, including \$71,077,306 of interest on the debt.

The currency of the U. S. has been a mixed one of gold, silver, and copper, and bank-notes. A specie currency was for many years the only money recognized by the Federal government; paper-money being issued by banks chartered by the states. The exigencies of the war of 1861-1865 compelled the government to issue large amounts of paper-money, and to establish a system of national banks, in 1871, 1867 in number, issuing government paper. The paper circulation of the U. S., Oct. 31, 1862, was—Legal tender notes \$346,681,016; issue of the national banks, \$861,000,946. The capital of national banks was \$473,947,715, and of private upwards of \$231,000,000.

The specie currency of the U. S. consists of the gold dollar (value in exchange about 4s. sterling); the half-eagle, \$5; the eagle, \$10; the double eagle, \$20; silver dollar, half-dollar, quarter; dime, 10 cents, half-dime, nickel; cent, or 100th part of a dollar. The coinage of 1862 was—gold, \$80,413,447; silver, \$27,783,888; copper, \$644,787.

Army and Navy.—The army of the U. S., under the command of the President, consisted, in 1790, of 1360 men. In 1861, its numbers were 14,000, and those who took part with the Confederates, or were disbanded in the Confederate States, reduced the number to about 5000. April 15, 1861, 75,000 volunteers were called out; May 4, 64,000; July and December 1861, 500,000; July 1, 1862, 800,000; August 4, 1862, 800,000; summer of 1863, 800,000; February 1, 1864, 500,000. The total number called out from 1861 till the end of the war in 1865, was 2,670,874. This vast army was procured by volunteering, by enlistment in the regular army, and by drafts or conscriptions; but the greater part by bounties of 800 to 1000 dollars to each volunteer. Large numbers of recruits were also found among newly arrived immigrants; and the negro troops recruited in the seceded or slave states, in October 1863, numbered 23,707, and increased in numbers to the end of the war. In 1871, the regular army was reduced to the legal standard of 80,000 enlisted men, and it was subsequently enacted that from 1875 there should be no more than 25,000 men enlisted at any one time. The militia of the U. S., organized under the state governments, numbers 3,245,198. There are numerous arsenals and manufactories of arms at Springfield (q. v.), Massachusetts; Pittsburg (q. v.), Pennsylvania, &c. The Military Academy at West Point educates cadets, nominated from each state by members of Congress, and appointed by the President, who receive commissions as officers in the army.

The navy of the U. S. in 1861 consisted of 24 iron-clads, 66 other steamers, and 23 sailing-vessels. The iron-clad turret-steamers (see TURRET-SHIP) called monitors, constitute a powerful portion of the American navy. A Naval Academy has been established at Annapolis, Maryland, for the education of naval cadets.

The post-office Department, organized before the Revolution of 1775 by Benjamin Franklin, had in the year ending June, 30, 1876, 46,231 offices. There passed through the post 1,100,000,000 letters, &c.

The Secretary of the Interior has charge of the survey and sale of the public lands of the U. S., the Patent Office, Indian Office, Pension Office, Public Buildings, National Hospital for the Insane, Public Printing, and Education.

History.—The territories now occupied by the U. S. of America, though they were probably visited on their north-eastern coast by Norse navigators about the year 1000, continued the sole possession of numerous tribes of Indians (who had succeeded earlier and extinct races), until the discovery of America by Columbus, 1492. In 1493, an English expedition, under the command of Sebastian Cabot, explored the eastern coast of America from Labrador to Virginia, perhaps to Florida. In 1513, Juan Ponce de Leon landed near St Augustine in Florida, and explored a portion of that region in a romantic search for the Fountain of Youth. In 1520, some Spanish vessels from St Domingo were driven upon the coast of Carolina. In 1521, by the conquest of Cortes and his followers, Mexico, including Texas, New Mexico, and California, became a province of Spain. In 1539—1542, Ferdinand de Soto led a Spanish expedition from the coast of Florida across Alabama, and discovered the Mississippi River. In 1584—1585, Sir Walter Raleigh sent two expeditions to the coast of North Carolina, and attempted to form settlements on Roanoke Island. A Spanish settlement was made at St Augustine, Florida, 1565. Jamestown, Virginia, was settled in 1607; New York, then called the New Netherlands, 1613; Plymouth, Massachusetts, 1620. A large part of the country on the great lakes and on the Mississippi was explored by La Salle in 1683; and settlements were made by the French at Kaskaskia and Arkansas Post, 1685; Mobile and Vincennes, 1702. The early history of the various colonies which now constitute the U. S. will be found under the heads of the different states and territories. The first effort at a union of colonies was in 1643, when the settlements in Massachusetts, New Hampshire, Rhode Island, and Connecticut formed a confederacy for mutual defence against the French, Dutch, and Indians, under the title of "The United Colonies of New England." They experienced the benefits of united action in 1754, when an English grant of lands to the Ohio Company brought on the French and Indian war—the French claiming, at that period, as the first explorers, Northern New England, half of New York, and the entire Mississippi Valley. George Washington was sent on his first expedition, to remonstrate with the French authorities; and the colonies being advised to unite for general defence, a plan for a general government of all the English colonies was drawn up by Benjamin Franklin; but it was rejected by both the colonies and the crown—by the colonies, who wished to preserve their separate independence, and by the crown from a jealousy of their united strength. The colonists, however, took an active part in the war. Under Major Washington, they joined General Braddock in his unfortunate expedition against Fort Duquesne, now Pittsburg; they aided in the reduction of Louisburg, Concordia, Crown Point, and Niagara; and rejoiced in the conquest of Quebec, by which the vast northern regions of America became the possessions of Great Britain.

The principles of a democratic or representative government were brought to America by the earliest colonists. The colonies themselves were founded by private adventure, with very little aid from government. The Plymouth colony was for 18 years a strict democracy, and afterwards a republic under a charter from the crown. A representative and popular government was established in Virginia in 1620. It was not until the Protectorate and the reign of Charles II. that the colonies were considered as portions of the empire, to be governed by parliament, when navigation acts were passed to give English ships a monopoly of commerce, when the produce of the colonies was required to be sent to England, and duties were levied on commodities sent from one colony to another. Protests were made against these assumptions; Virginia asserted her right of self-government; and it was not until the English revolution of 1688 that settled and uniform relations with the different colonies were established.

In 1713, by the treaty of Utrecht, England, which, since the reign of Elizabeth, had imported slaves from Africa into her American and West Indian colonies, obtained a monopoly of the slave-trade, engaging to furnish Spanish America, in 33 years, with 144,000 negroes. A great slave-trading company was formed in England, one quarter of the stock being taken by Queen Anne, and one-quarter by the king of Spain, these two sovereigns becoming the greatest slave-dealers in Christendom. By this monopoly, slavery was extended in, and to some extent forced upon, all the American colonies.

At this period, there was a general feeling of loyalty towards the mother country.

The sons of the more wealthy colonists, especially in the south, were educated in England; English literature pervaded the colonies; the British throne was the fountain of honor; the colonies, though distinct, and differing in origin and character—Puritan in the East, Dutch Reformed in New York, Quaker in Pennsylvania, Catholic in Maryland, and Church of England in Virginia—were yet united by language, common ties, fears, and interests. In 1761, the enforcement of the Navigation Act against illegal traders, by general search-warrants, caused a strong excitement against the government, especially in Boston. The admiralty enforced the law; many vessels were seized; and the colonial trade with the West Indies was annihilated. In 1763, the passing of an act of parliament for collecting a colonial revenue by stamps caused general indignation, and led to riots. Patrick Henry, in the Virginia Assembly, denied the right of parliament to tax America, and eloquently asserted the dogma, "no taxation without representation." The first impulse was to unite against a common danger; and the first colonial congress of 28 delegates, representing 9 colonies, made a statement of grievances and a declaration of rights. The stamps were destroyed or reshipped to England, and popular societies were formed in the chief towns, called "Sons of Liberty." In 1766, the Stamp Act was repealed, to the general joy of the colonists; but the principle of colonial taxation was not abandoned; and in 1767, duties were levied on glass, paper, printers' colors and tea. This renewed attempt produced, in 1768, riots in Boston, and Governor Gage was furnished with a military force of 100 to preserve order and enforce the laws. In 1773, the duties were repealed, excepting 8d. a pound on tea. It was now a question of principle, and from north to south it was determined that this tax should not be paid. Some cargoes were stored in damp warehouses and spoiled; some sent back; in Boston, a mob, disguised as Indians, threw it into the harbor. To punish this outrage, parliament passed the Boston Port Bill, 1774, by which the chief town of New England was no longer a port of entry, and its trade transferred to Salem. The people were reduced to great distress, but received the sympathy of all the colonies, and liberal contributions of wheat from Virginia, and rice from Charleston, South Carolina.

It was now determined to enforce the government of the crown and parliament over the colonies; and a fleet, containing several ships of the line, and 10,000 troops, was sent to America; while the colonists, still asserting their loyalty, and with little or no thought of separation from the mother country, prepared to resist what they considered the unconstitutional assumptions of the government. Volunteers were drilling in every direction, and dépôts of provisions and military stores were being gathered. A small force being sent from Boston to seize one of these dépôts at Concord, Massachusetts, led to what is called the battle of Lexington, and the beginning of the war of the Revolution, April 19th, 1776. The British troops were attacked on their return by the provincials, and compelled to a hasty retreat. The news of this event summoned 20,000 men to the vicinity of Boston. The royal forts and arsenals of the colonies were taken possession of, with their arms and munitions. Crown Point and Ticonderoga, the principal northern fortifications, were surprised, and their artillery and stores appropriated. A Congress of the colonies assembled at Philadelphia, which resolved to raise and equip an army of 20,000 men, and appointed George Washington commander-in-chief. June 17, Bunker Hill, in Charleston, near Boston, where 1500 Americans had hastily intrenched themselves, was taken by assault by the British troops, but with so heavy a loss (1054) that the defeat had for the provincials the moral effect of a victory. After a winter of great privations, the British were compelled to evacuate Boston, carrying away in their fleet to Halifax 1500 loyal families.

The British government now put forth a strong effort to reduce the colonies to submission. An army of 55,000, including 17,000 German mercenaries ("Hessians"), was sent, under the command of Sir William Howe, to put down this "wicked rebellion." The provincial Congress, declaring that the royal authority had ceased, recommended to the several colonies to adopt "such governments as might best conduce to the safety and happiness of the people;" and the thirteen colonies soon adopted constitutions as independent and sovereign states. On the 7th of June 1776, Richard Henry Lee, of Virginia, offered a resolution in Congress, declaring that "the united colonies are, and ought to be, free and independent states; that they are absolved from all allegiance to the British crown; and that all political connection between them and the state of Great Britain is, and ought to be, totally dis-

solved." This resolution, after an earnest debate, was adopted by the votes of 9 out of 12 colonies. A committee, consisting of Thomas Jefferson, John Adams, Benjamin Franklin, Roger Sherman, and Robert R. Livingston, was instructed to prepare a declaration in accordance with the above resolution; and the celebrated Declaration of Independence, written by Mr. Jefferson, based upon the equality of men and the universal right of self-government, and asserting that "all government derives its just powers from the consent of the governed," on the 4th of July 1776, received the assent of the delegates of the colonies, which thus dissolved their allegiance to the British crown, and declared themselves free and independent states, under the general title of the thirteen United States of America—New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, and Georgia—occupying a narrow line of the Atlantic coast between Canada and Florida, east of the Alleghenies, with a population of about 2,500,000.

After the evacuation of Boston, General Washington, with the remains of his army, thinned by the hardships of winter, hastened to New York. On the 2d of July, General Howe, being joined by his brother, Admiral Lord Howe, and Sir Henry Clinton, found himself at the head of 85,000 men; defeated the Americans on Long Island, August 27, 1776, compelled the evacuation of New York, and secured the possession of its spacious harbor, and the river Hudson. General Washington, with inferior and undisciplined forces, retreated across New Jersey, closely followed by the English, hoping to save Philadelphia. Newark, New Brunswick, Princeton, the chief towns in New Jersey, were taken, and the British awaited the freezing of the Delaware to occupy Philadelphia. On Christmas night, General Washington, by crossing in boats among floating ice, made a successful night attack upon a Hessians force at Trenton, and gave new courage to the desponding Americans, who recruited the army, and harassed the enemy with a winter campaign.

In the meantime, Silas Deane and Benjamin Franklin had been sent to France to solicit recognition and aid. The recognition was delayed, but important aid was privately given in money and supplies, and European volunteers—the Marquis de Lafayette, Baron Steuben, Baron de Kalb, Kosciuszko, and Pulaski, rendering the most important services. Efforts were made to induce the British colonies of Canada and Nova Scotia to unite in the struggle for independence, and an expedition was sent against Montreal and Quebec, led by Generals Montgomery and Arnold. The Canadians refused their aid; Montgomery was killed, Arnold wounded, and the remains of the expedition returned after terrible sufferings. In 1777, after several severe actions in New Jersey, generally disastrous to the Americans, the British took possession of Philadelphia; and Washington, with the remnants of his army, went into winter-quarters at Valley Forge, where they suffered from cold, hunger, and nakedness.

While Washington was unsuccessfully contending against disciplined and overwhelming forces in New Jersey, General Burgoyne was leading an army of 7000 British and German troops, with a large force of Canadians and Indians, from Canada into Northern New York, to form a junction with the British on the Hudson, and separate New England from the rest of the rebel confederacy. His march was delayed by felled trees and destroyed roads; his foraging expeditions were defeated; and after two sharp actions at Stillwater and Saratoga, with but three days' rations left, he was compelled to capitulate, October 17; and England, in the midst of victories, heard with dismay of the loss of an entire army. The Americans gained 6000 muskets, and a large train of artillery. Feeling the need of more unity of action, articles of confederation, proposed by Franklin in 1775, were adopted in 1777, which constituted a league of friendship between the states, but not a government which had any powers of coercion.

In 1778, Lord Carlisle was sent to America by the British government with offers of conciliation; it was too late. France at the same time recognised American independence, and sent a large fleet and supplies of clothing, arms, and munitions of war to their aid; and General Clinton, who had superseded General Howe, finding his supplies at Philadelphia threatened, retreated to New York, defeating the Americans at Monmouth.

The repeated victories of the British armies, the aid afforded by great numbers of Americans who still adhered to the royal cause, and frustrated during the war not

less than 20,000 troops, and the alliance of large tribes of Indians, who committed cruel ravages in the frontier settlements, did little towards subjugating the country. Portions of the sea-coast of New England and Virginia were laid waste; but the king's troops were worn out with long marches and tedious campaigns, and even weakened by victories. Spain, and then Holland, joined in the war against England, and aided the Americans. Paul Jones, with ships fitted out in French harbors, fought desperate battles under the American flag on the English coast. But the king and parliament were determined to maintain the honor of the crown and the integrity of the empire. In 1780, 35,000 seamen were raised, and 35,000 additional troops sent to America, and a strong effort was made to subjugate the Carolinas, where the war became of a bitter partisan character, and was conducted with spirit by Sumpter, Marion, and other Southern chieftains. Lord Cornwallis, with a large army, marched from Charleston, through North Carolina, pursuing, and sometimes defeating the American General Gates. Worn out with his success, he arrived in Virginia, where he was confronted by General Lafayette. In the meantime, Admiral de Varnay had arrived upon the coast with a powerful French fleet, and 6000 soldiers of the elite of the French army, under Count de Rochambeau. Cornwallis was obliged to fortify himself at Yorktown, blockaded by the fleet of Count de Grasse, and besieged by the allied army of French and Americans, waiting for Sir Henry Clinton to send him relief from New York. October 19, 1781, he was compelled to surrender his army of 7000 men—an event which produced such a change of feeling in England as to cause the resignation of the ministry, and the despatch of General Sir Guy Carleton to New York with offers of terms of peace. The preliminaries were signed at Paris, November 30, 1782; and on September 3, 1783, peace was concluded between England and France, Holland, and America. The independence of each of the several states was acknowledged, with a liberal settlement of territorial boundaries. In April, a cessation of hostilities had been proclaimed, and the American army disbanded; New York, which had been held by the English through the whole war, was evacuated November 25; on December 4, General Washington took leave of his companions in arms, and, December 23, resigned into the hands of Congress his commission as commander.

From the retreat of Lexington, April 19, 1776, to the surrender of Yorktown, October 19, 1781, in 24 engagements, including the surrender of two armies, the British losses in the field were not less than 35,000 men, while those of the Americans were about 8000.

The states were free, but exhausted with a foreign debt of \$3,000,000, a domestic debt of \$30,000,000, an army unpaid and discontented, a paper-currency utterly worthless, and a bankrupt treasury. The states were called upon to pay their shares of the necessary expenditures, but they were also in debt, and there was no power to compel them to pay, or to raise money by taxation. In these difficulties, and the failure of the articles of confederation, a convention was summoned by Congress in 1787, to revise these articles. The task was so difficult, that the Convention resolved to propose an entirely new constitution, granting fuller powers to a Federal Congress and executive, and one which should act upon the people individually as well as upon the states. The constitution was therefore framed, whose provisions have already been stated, and which is still the basis of the government; and though strongly opposed by many, who believed that the extensive powers granted by it to Congress and the executive would be dangerous to the liberties of the people, it was, in 1787—1788, adopted, in some cases by small majorities, in 11 state conventions, and finally by the whole 13 states, chiefly through the exertions and writings of James Madison, John Jay, and Alexander Hamilton. Virginia ratified the constitution by the declaration, that she was at liberty to withdraw from the union whenever its powers were used for oppression; and New York, after Hamilton had declared that no state could ever be coerced by an armed force. The country was at this period divided into two parties: the Federalists, who were in favor of a strong centralised government, and the Anti-federalists, who held to the sovereignty and rights of the independent states. George Washington and John Adams, standing at the head of the Federalist party, were elected President and Vice-president of the United States. The President took the oath to support the constitution in front of the City Hall in New York; and the government was organised with Thomas Jefferson, Secretary of State; Alexander Hamilton, Secretary of the Treas-

ury; General Knox, Secretary of War; and John Jay, Chief Justice of the supreme court. Congress assumed the war-debts of the several states, and chartered the bank of the United States, though its constitutional right to do so was strenuously denied by the Republican or States' Rights party. Washington was re-elected to the presidency in 1793; but party-spirit increased, excited by the events of the French Revolution. Citizen Genet, who represented the French Republic in America, fitted out privateers against England, and his recall was demanded by the President. The Federalists took the side of England in the great European contest, while the Republicans sympathised with the Revolution. There grew up also difficulties between the English and American governments. The Americans accused the English of carrying off large numbers of negroes and other property at the close of the war; while the English accused the Americans of sequestrating the property of loyalists, which they had engaged by treaty to restore to them. These controversies were happily settled by Mr Jay.

In 1796, Washington, worn and irritated by partisan conflicts and criticisms, refused a third election, and issued his farewell address to the people of the U. S., warning them against the dangers of party-spirit and dissension, and giving them advice worthy of one who was said to be "first in war, first in peace, and first in the hearts of his countrymen." John Adams was elected President; and Thomas Jefferson, the second choice of the people for the presidency became, according to the rule at first adopted, Vice-president. In 1798, the commercial regulations of France, and the assertion of the right to search and capture American vessels, nearly led to a war between the two republics. In 1799, the nation without distinction of party, mourned the death of Washington; and, in the following year, the seat of government was removed to the city he had planned for a capital, and which bears his name. The partiality of Mr Adams for England, the establishment of a Federal army, and the passing of the Alien and Sedition Laws, by which foreigners could be summarily banished, and abuse of the government, by speech or the press, punished, caused great political excitement, and such an increase of the Republican, or, as it was afterwards called, the Democratic party, that the President failed of a re-election in 1801; and there being no election by the people, the House of Representatives, after thirty-five ballots, chose Thomas Jefferson, the Republican candidate, with Aaron Burr for Vice-president; and the offices of the country were transferred to the victorious party. Internal duties, which a few years before had led to an insurrection in Pennsylvania, called the Whisky Insurrection, were abolished, and the Alien and Sedition Laws repealed. Tennessee, Kentucky, Vermont, and Ohio had now been organised as states, and admitted into the Union. In 1803, the area of the country was more than doubled by the purchase of Louisiana—the whole region between the Mississippi and Rocky Mountains—from France for \$15,000,000. The infant navy waged a successful war with Tripoli. In 1806, Mr Jefferson was elected for a second term; but Mr Burr, having lost the confidence of his party, engaged in a conspiracy to seize upon the Mississippi Valley, and found a new empire, with its capital at New Orleans. He was tried for treason, but not convicted. The commerce of America was highly prosperous, her ships enjoying much of the carrying-trade of Europe; but in May 1806, England declared a blockade from Bristol to the Elbe, and Bonaparte, in November, decreed the blockade of the coasts of the United Kingdom. American vessels were captured by both parties, and were searched by British ships for British subjects; and those suspected of having been born on British soil, were, in accordance with the doctrine, once a subject always a subject, impressed into the naval service. Even American men-of-war were not excepted from this process. The British frigate *Leopard* meeting the American frigate *Chesapeake*, demanded four of her men, and on refusal, fired into her, and the surprised *Chesapeake* struck her flag. British ships were heretofore forbidden U. S. harbours.

Mr Jefferson, following the example of Washington, declined a third election; and, in 1809, James Madison became President. The French decrees, prejudicial to neutral commerce, were revoked in 1810; but the English continued a source of loss and irritation, while hundreds of American citizens were in forced service in British vessels. The feeling was increased by a night-encounter between the American frigate *President* and the British sloop-of-war *Little Belt*, May 16, 1811. In April

1812, an embargo was again declared by Congress, preparatory to a declaration of war against Great Britain, July 19, for which Congress voted to raise 35,000 enlisted soldiers, 50,000 volunteers, and 100,000 militia. General Hull, with 2000 men at Detroit, invaded Canada; but on being met by a small force of British and Indians, under General Brock, recrossed the river, and made a shameful surrender; and was sentenced to death for his cowardice, but pardoned by the President. A second invasion of Canada was made near Niagara Falls by General Van Rensselaer. One thousand American militia stormed the heights of Queenstown, and the British general, Brock, was killed; but reinforcements arriving opportunely, the heights were retaken, and nearly all the Americans were killed or driven into the Niagara, while the American general was in vain imploring a large body of militia on the opposite bank to cross over to the support of their brethren in arms. They refused, upon the ground, that the government had no constitutional right to send the militia across the frontier. The Federal party, opposed to the war, defended this doctrine, and General Van Rensselaer resigned in disgust. American disasters on the land were, however, compensated by victories at sea. August 19, the U. S. frigate *Constitution* captured the British frigate *Guerriere*; October 18, the *Wasp* took the *Prote*; October 25, the frigate *United States* captured the *Macedonian*; December 20, the *Constitution* took the *Java*. The Americans in most cases had the larger ships and heavier ordnance; but the immense disparity in losses showed also superior seamanship and gunnery. American privateers took 500 British vessels and 2000 prisoners. In 1812, General Proctor crossed the Detroit river with a considerable force of British and Indians, and defeated General Winchester, with the usual results of savage warfare. In April, an American army of 1700 men captured York (now Toronto), and about the same time another American force of 800 men was defeated with great loss by the Indians under Tecumseh; but the remainder of this campaign was wholly favorable to the Americans. The attempt of the British general, Prevost, on Sackett's Harbor was repulsed; the squadron on Lake Erie, consisting of 6 vessels, 63 guns, was captured by Commodore Perry at the head of an American flotilla of 9 vessels, 54 guns; and this latter success enabled General Harrison to invade Canada, where he defeated General Proctor in the battle of the Thames, in which the great Indian warrior-chief Tecumseh was killed. In 1812, another invasion of Canada was attempted; and York (now Toronto) was taken by General Dearborn; and an unsuccessful attempt was made to take Montreal. Villages were burned on both sides. The British also destroyed American shipping in Delaware Bay. At the same period, General Jackson defeated the Creek Indians in Alabama and Georgia, who had been excited to make war upon the frontier settlements.

In 1814, Generals Scott and Ripley crossed the Niagara, and sharp actions, with no decisive results, were fought at Chippewa and Lundy's Lane, close by the great Cataract. General Wilkinson also invaded Canada on the St. Lawrence river, but was easily repulsed. A British invasion, by Lake Champlain, by General Sir George Prevost, with 14,000 men and a flotilla on the lake, was no more successful. On the 6th of September, the flotilla was defeated and captured in the harbor of Plattsburg, while the army was repulsed on shore, and retreated with heavy loss. In August, a British fleet ascended Chesapeake Bay, took Washington with but slight resistance, and burned the government buildings. A subsequent attack on Baltimore was unsuccessful. New York, New London, and Boston were blockaded, and a large expedition was sent against Mobile and New Orleans. On the 8th of January 1815, General Packenham advanced with 12,000 men against the latter city, which was defended by General Jackson, at the head of 6,000 militia, chiefly from Tennessee and Kentucky, aided by a small force of artillery, recruited from the Baratania pirates. The Americans were sheltered by a breast-work, and the British assault was met with so deadly a fire of riflemen, that it was repulsed, with the loss of General Packenham and several others, with 700 killed and 1000 wounded; while the entire American loss is stated to have only amounted to 71. This ill-planned and unfortunate action was fought more than a month after peace had been concluded between England and America, and was followed by two naval actions in February and March. Though during this contest fortune at first favored the Americans on the high seas, she changed sides completely from June 1812, as if to counterbalance the

directors of the British on land. June 1, the *Chesapeake* was taken by the *Shannon*; June 2, the *Growler* and *Eagle* were captured by British gun-boats; the *Argus* was taken by the *Pelican*, August 14; the *Bux* by the *Phæbe* and *Cherub*, March 29, 1814; the *President* by the *Endymion*, January 15, 1815; the only counterbalancing success being the sinking of the British sloop *Acon* by the *Wasp*, September 8, 1814. In December 1814, the Federalists of New England held a convention at Hartford in opposition to the war and the administration, and threatened a secession of the New England states. See **HARTFORD CONVENTION**. In 1815, Commodore Decatur, who had taken a distinguished part in the recent war, commanded an expedition against the Algerians—whose corsairs had preyed on American commerce in the Mediterranean—and dictated terms to Algiers, Tunis, and Tripoli.

The Democratic Republican party having brought the war to a satisfactory conclusion, the Federalists disappeared; and in 1817, James Monroe was elected to the presidency, almost without opposition, in what was termed "the era of good feeling." A rapid emigration from Europe and from the Atlantic states to the richer lands of the West, had in ten years added six new states to the Union. Difficulties arose with the warlike southern Indian tribes, whose hunting-grounds were invaded; and General Jackson, sent against the Seminoles, summoned to his aid the Tennessee volunteers who had served under him against the Creeks and at New Orleans, defeated them, pursued them into Florida, took Pensacola, and banished the Spanish authorities and troops. He was, however, supported in these high-handed measures by the President; and in 1819, Florida was ceded by Spain to the United States. In 1820, Alabama and Maine, a slave and a free state, were added to the Union; and the question of the admission of Missouri arose in Congress—the question of its admission with or without slavery. At the period of the Revolution, slavery existed in all the states except Massachusetts; but it had gradually been abolished in the northern and middle states, except Delaware, and excluded from the new states between the Ohio and Mississippi by the terms on which the territory had been surrendered by Virginia to the Union. Under the constitution, slaves were not counted in full as a represented population; but by a compromise, three-fifths of their numbers were added to the whites. The slave states were almost exclusively agricultural, with free-trade interests. The free states were encouraging manufactures by protection. The two sections had already entered upon a struggle to maintain the balance of power against each other. After an excited contest, Missouri was admitted, with a compromise resolution, that in future no slave state should be erected north of the parallel of $36^{\circ} 30'$ n. lat.—the northern boundary of Arkansas. During the second term of Mr Monroe in 1824, General Lafayette visited America, and was everywhere received with great enthusiasm. In the presidential election of 1824, there were four candidates—John Quincy Adams, Andrew Jackson, Henry Clay, and William H. Crawford. There being no choice by the people, the House of Representatives chose Mr Adams; John C. Calhoun being elected Vice-president. Party and sectional feeling became stronger. Mr Adams and Mr Clay, who had heretofore acted with the party of Jefferson and Madison, were henceforth identified with what was called the National Republican, and later, the Whig, and finally, in union with the Anti-slavery party, the Republican party. In 1826, two of the founders of the republic, John Adams and Thomas Jefferson, died on the 4th of July, the anniversary of the Declaration of Independence—an event which made a profound impression. The four years of Mr Adams, during which there were violent contests on protection and the powers of the Federal government to carry out public works within the states, ended with an excited election contest, which resulted in the triumph of the Democratic party, and the election of Andrew Jackson, with John C. Calhoun as Vice-president. The bold, decisive, and impetuous character of General Jackson was shown in a general removal of those who held office, down to small postmasters and tide-writers, under the late administration, and the appointment of his own partisans. An act for the rechartering of the U. S. Bank was met by a veto of the President, who declared it unconstitutional and dangerous. In 1832, an Indian war, called the Black Hawk War, broke out in Wisconsin; but the passing of a high protective tariff act by Congress caused a more serious trouble. The state of South Carolina declared the act unconstitutional, and therefore null and void, threatening to withdraw from the Union if any attempt were made to collect the duties on foreign importations. The

President prepared to execute the laws by force; Mr Calhoun resigned his office of Vice-president, and asserted the doctrine of state-rights, including the right of secession, in the Senate. A collision seemed imminent, when the affair was settled by a compromise bill, introduced by Henry Clay, providing for a gradual reduction of duties, until 1848, when they should not exceed 30 per cent. *ad valorem*.

The popularity of General Jackson caused his re-election by an overwhelming majority against Henry Clay, the leader of the Bank, Protection, and Internal Improvement party; and he entered upon his second term with Martin Van Buren of New York as Vice-president. The removal of the government deposits from the U. S. Bank to certain state banks, led to the failure of the bank, and after some years, to the adoption of Mr Van Buren's plan of an independent treasury. The Cherokee Indians in Georgia, who had attained to a certain degree of civilisation, appealed to the President for protection against the seizure of their lands by the state; but they were told that he "had no power to oppose the exercise of the sovereignty of any state over all who may be within its limits;" and the Indians were obliged to remove to the territory set apart for them west of the Mississippi. In 1836, the Seminole war broke out in Florida; and a tribe of Indians, insignificant in numbers, under the crafty leadership of Osceola (q. v.), kept up hostilities for years, at a cost to the U. S. of several thousands of men and some fifty millions of dollars. In 1837, Martin Van Buren succeeded General Jackson in the presidency. His term of four years was a stormy one, from the great financial crisis of 1837, which followed a period of currency-expansion and wild speculation. All the banks suspended payment, and the great commercial cities threatened insurrection. Mr Van Buren was firm in adhering to his principle of collecting the revenues of the government in specie, and separating the government from all connection with the banks. His firmness in acting against the strong sympathies of the northern and western states with the Canadian insurrection of 1837—1838, also damaged his popularity; and in 1840, the election of General Harrison, with John Tyler for Vice-president, was one of unexampled excitement, characterised by immense popular gatherings, political songs, the use of symbols, and the participation of both sexes to a degree hitherto unknown in America. The Whigs triumphed in nearly every state; General Harrison was inaugurated March 4, 1841; and the rush to Washington for offices was as great as the election had been exciting and remarkable. Worn down with the campaign and the office-seekers, General Harrison died in a month after his inauguration, and was succeeded by John Tyler, who, having been a Democrat, was no sooner in power than he seems to have reverted to his former political principles. He vetoed a bill for the establishment of a national bank and other measures of the party by which he had been elected. His cabinet resigned, with the exception of Daniel Webster, Secretary of State, and others, Democratic or neutral, were appointed in their place. During Mr Tyler's administration, the north-eastern boundary question, which nearly occasioned a war with England, was settled by Mr Webster and Lord Ashburton; a difficulty amounting almost to a rebellion, was settled in Rhode Island; but the most important question agitated was that of the annexation of Texas. This annexation was advocated by the South, as a large addition to southern and slave territory; and, for the same reason, opposed by the Whig and anti-slavery parties of the North. Besides, the independence of Texas, though acknowledged by the U. S., England, had not been acknowledged by Mexico, and its annexation would be a *casus belli* with that power. The recent admissions of Iowa and Florida into the Union had kept the balance of power even between North and South, but Texas would be an advantage to the South. But the gain of territory, and a contempt for Mexico, overcame these objections, and in 1845, Texas was formally annexed to the U. S.; and James K. Polk of Tennessee succeeded Mr Tyler in the presidency.

M. Almonte, the Mexican minister at Washington, protested against the annexation of Texas, as an act of warlike aggression; and to guard against a threatened invasion of Texas, General Zachary Taylor was ordered, with the U. S. troops of the military district, to its southern frontier. The Mexicans crossed the Rio Grande and commenced hostilities, April 26, 1845. General Taylor moved promptly forward, and won the victories of Palo Alto, Resaca de la Palma, Monterey, Saltillo, and finally, against great odds—20,000 to 4750—the hard-fought battle of Buena Vista, a victory that excited great enthusiasm. In the meantime, General Wool had been

sent on an expedition to Chihuahua, in Northern Mexico; General Kearney to New Mexico; and Captain Fremont and Commander Stockton took possession of California. March 9, 1847, General Scott landed at Vera Cruz, which he took on the 29th, after a siege and bombardment by land and water. Marching into the interior with a force of about 9000 men, he found General Santa Anna entrenched on the heights of Cerro Gordo with 15,000 men. On April 18, every position was taken by storm, with 8000 prisoners, 48 cannon, 5000 stand of arms, &c. Waiting at Puebla for reinforcements until August, General Scott advanced with 11,000 men toward Mexico, near which General Santa Anna awaited him with large forces and in strong positions. On the 19th and 20th of August were fought the battles of Contreras and Churubusco, in which 9000 Americans vanquished an army of over 30,000 Mexicans in strongly fortified positions. After a brief armistice, hostilities recommenced on the 7th September; and after a series of sanguinary actions, the American army, reduced to about 8000, entered the city of Mexico, which ended the war. By a treaty of Guadalupe, the U. S. obtained the cession of New Mexico and Upper California, the U. S. paying Mexico \$15,000,000, and assuming the payment of the claims of American citizens against Mexico. The opposition to the annexation of Texas, and to the war and the acquisition of the newly-acquired territory, became now complicated and intensified by sectional feelings and the opposition to slavery. The Northern party demanded that slavery should never be introduced into territories where it had not existed; the South claiming the right of her people to emigrate into the new territories, carrying with them their domestic institutions. During the debates on the acquisition of the Mexican territories, Mr. Willmot of Pennsylvania introduced an amendment, called the "Willmot Proviso," providing that there should be neither slavery nor involuntary servitude in the acquired territory. This was voted down, but became a party principle. In 1849, General Taylor, the "Rough and Ready" victor of Buena Vista, became President, with Millard Fillmore as Vice-president. The Free-soil party* had nominated Martin Van Buren, with Charles Francis Adams for Vice-president; the Democratic candidate being General Lewis Cass; The Liberty party in 1840 had cast 7609 votes; in 1844, it had 62,300; Mr. Van Buren in 1848 received 291,263, so rapid was the growth of a party soon destined to control the policy of the government. September 1, 1849, California, rapidly peopled by the discovery of gold, adopted a constitution which prohibited slavery. Violent struggles and debates in Congress followed, with threats of secession, and protests against interference with slavery. The more zealous abolitionists of the North denounced the constitution for its support of slavery, and its requirement of the return of fugitive slaves to their owners, and threatened separation. The South denounced the violation of the constitution by interference with slavery—a domestic institution of the states—the carrying off of negroes secretly by organised societies, and what was termed the "Underground Railway," and the passage of personal liberty bills in several states, which defeated the Fugitive Slave Law, and the requirements and guarantees of the constitution. Mr. Clay introduced a compromise into Congress, admitting California as a free state, and introducing a new and more stringent law for the rendition of fugitive slaves. President Taylor, more used to the rough life of a frontier soldier than the cares of state, died July 9, 1850, and was succeeded by Mr. Fillmore.

The election of Franklin Pierce in 1853, against General Scott, was a triumph of the Democratic, States Rights, and Southern party. Jefferson Davis, a senator from Mississippi, a son-in-law of General Taylor, and who had served under him in Mexico, was appointed Secretary of War. New elements were added to the sectional controversies which agitated the country by the repeal of the Missouri Compromise, and the passage of the Kansas-Nebraska bill of Senator Douglas, which left the people of every territory, on becoming a state, free to adopt or exclude the institution of slavery. The struggles of Kansas, approaching a civil war between the Free-soil and Pro-slavery parties in that rapidly growing territory, resulted in the exclusion of slavery. A brutal assault upon Mr. Sumner, senator from Massachusetts, by a Southerner, named Preston Brooks, in consequence of a violent speech on Southern men and institutions, increased the excitement of both sections. The formation of

* The Free-soil party opposed the extension of slavery by the admission of new slave states, while recognising its legal and constitutional existence where already established.

an Anti-foreign and No-popery party, called the "Know-nothing" party, acting chiefly through secret societies, was a singular but not very important episode in American politics, though it may have influenced the succeeding election.

In 1856, the Republicans, composed of the Northern, Free-soil, and Abolition parties, nominated John C. Fremont for the presidency, while the Democratic and States' Rights party nominated James Buchanan. Ex-president Fillmore received the Know-nothing nomination. The popular vote was—for Buchanan, 1,833,169; Fremont, 1,341,264; Fillmore, 874,534. Mr Buchanan was inaugurated March 4, 1857, with John C. Breckenridge, afterwards a general of the Confederate army, as Vice-president. A difficulty with the Mormons, which caused the President to send a military force to Utah, was settled without bloodshed. The efforts of the government to execute the Fugitive Slave Law kept up an irritated feeling. There were savage fights between the northern and southern parties in Kansas, and on the western borders of Missouri. Resolute and well-armed settlers were sent out by New England emigration societies. In October 1859, John Brown, known in Kansas as "Oseawattamie Brown," who, with his sons, had been engaged in the struggles in Kansas, planned and led an expedition for freeing the negroes in Virginia. He made his attempt at Harper's Ferry, on the Potomac, where, after a vain attempt to induce the negroes to join him, he and his small party took possession of one of the government workshops, where he was taken prisoner by a party of U. S. soldiers, and handed over to the authorities of Virginia, tried and executed, December 2. His body was taken to his home in New York for burial, and he was regarded by the Abolition party as a martyr.

In 1860, the Democratic party, which, except at short intervals, had controlled the Federal government from the election of Jefferson in 1800, became hopelessly divided. The Southern delegates withdrew from the convention at Charleston, and two Democratic candidates were nominated, Stephen A. Douglas of Illinois, and John C. Breckenridge of Kentucky; while the Republicans, or united Whig and Abolition party, nominated Abraham Lincoln of Illinois; and the Native or American party nominated John Bell of Tennessee. The Republican convention adopted a moderate and even conservative "platform" of principles, denounced the John Brown raid, and put forward as a principle, "the maintenance inviolate of the rights of the states, and especially the right of each state to order and control its own domestic institutions according to its own judgment exclusively." Still, the country was sectionally divided, and all who had labored to limit and destroy the Southern institution of slavery were acting with the Republican party.

At the election of November 1860, Mr Lincoln received every Northern vote in the electoral college, excepting the three of New Jersey, which were given to Mr Douglas, 180 votes; while Mr Breckenridge received the 72 electoral votes of the South. The North and South were arrayed against each other, and the South was beaten. Of the popular vote, Mr Lincoln received 1,867,610; Mr Douglas, 1,865,976; Mr Breckenridge, 847,951; Mr Bell, 590,681. Thus, while Mr Lincoln gained an overwhelming majority of the electoral votes given by each state, the combined Democratic votes exceeded his by 856,817, and the whole popular vote against him exceeded his own by 946,948. A small majority, or even plurality, in the Northern states was sufficient to elect him.

The South lost no time in acting upon what her statesmen had declared would be the signal of their withdrawal from the Union. On the 10th of November, as soon as the result was known, the legislature of South Carolina ordered a state convention, which assembled December 17, and on the 20th unanimously declared that "the union now subsisting between South Carolina and other states, under the name of the United States, is hereby dissolved;" giving as a reason that 14 of these states had for years refused to fulfil their constitutional obligations. The example of South Carolina was followed by Mississippi, January 8, 1861; Florida, 10th; Alabama, 11th; Georgia, 19th; which were followed by Louisiana and Texas; and in 1861, by North Carolina, Virginia, Tennessee, and Arkansas. Kentucky and Missouri were divided, and had no representatives in the governments and armies of both sections.

On the 4th of February 1861, delegates from the seven then seceded states met at Montgomery, Alabama, and formed a provisional government, under the title of the Confederate States of America. A constitution was adopted similar to that of the U. S., and the government fully organised, February 18, 1861; President, Jefferson Davis of Mississippi; Vice-president, Alexander H. Stephens of Georgia; and,

May 24, established at Richmond, Virginia. The secession movement appears to have been nearly unanimous in the more Southern states, and to have been carried in all by decided majorities. As state after state withdrew from the Union, its senators and representatives in Congress at Washington resigned their seats; and nearly all the officers of the army and navy, of Southern birth, believing that their first and final allegiance was due to their states, and that the action of each state carried with it all its citizens, also resigned their commissions, and tendered their swords to their respective states, and to the Confederacy they had formed.

President Buchanan, doubting his constitutional power to compel the seceding states to return to the Union, made a feeble and ineffectual attempt to relieve the garrison of Fort Sumter, in Charleston harbor, closely besieged by the forces of South Carolina. Commissioners were sent to Washington to negotiate for the settlement of the claims of the Federal government, and great efforts were made to effect compromise of the difficulties, but without result.

On the 4th of March 1861, President Lincoln was inaugurated at Washington. In his address, he said: "I have no purpose, directly or indirectly, to interfere with the institution of slavery in the states where it exists. I believe that I have no lawful right to do so, and I have no inclination to do so." On the 7th of April, a naval expedition set sail from New York for the relief of Fort Sumter; and its arrival off Charleston Harbor was the signal for the commencement of a bombardment of the fort by the Confederate batteries of General Beauregard. The surrender of the fort, April 11, was followed by a sudden outburst of excited feeling in the North. The government called out 75,000 volunteers, large numbers of whom were in a few days marching to the defence of Washington. April 18, the Confederates seized the U. S. arsenal at Harper's Ferry, and took or destroyed a large quantity of arms and machinery. On the 20th, the navy-yard, near Norfolk, Va., was destroyed by the U. S. officers, and five large men-of-war burned or sunk, to prevent their falling into the hands of the Confederates. Opposed to the Federal volunteers assembled at Washington, the Confederates took up a position at Bull Run, a few miles distant from the Potomac, under General Beauregard, where they were attacked by General McDowell. A severe action resulted in the repulse and complete panic of the Federals, who hastily retreated to Washington. Congress saw that it must act in earnest, and that the rebellion was not to be put down in 90 days by 75,000 volunteers. It voted to call out 500,000 men. The Confederate States had a population of 5,582,129 free inhabitants, and 3,519,903 slaves; total, 9,102,032; and though the negro were not called into the field except as laborers, they were not less useful in supplying the armies, by carrying on the agricultural labor of the country. The Confederates had also the strong sympathy and aid of the four slaveholding border states, prevented by their position by seceding—Delaware, Maryland, Kentucky, and Missouri.

Holding their position in Virginia, the Confederates erected fortifications on the Tennessee and Cumberland rivers, and on important points of the Mississippi, from Columbus, in Kentucky, to its mouth. They also made a strong effort to secure the state of Missouri, as well as to defend the seaports through which they must receive their most important supplies from abroad. The Federal government on its side, blockaded the whole line of coast from Virginia to Texas, and sent large forces to secure the doubtful states. Gunboats were rapidly built for the rivers of the west, and vessels purchased and constructed for the navy. In December 1861, the Federals had 640,000 men in the field; and the Confederates had 210,000, and had called for 400,000 volunteers.

The first important operation of 1862 was the taking the defences of the Cumberland and Tennessee rivers (February 6), which led to the occupation of Nashville, the capital of Tennessee, henceforth held by the Federals—Andrew Johnson, formerly governor and senator, having been appointed military governor. Roanoke Island was also captured, on the coast of North Carolina. In March, General McClellan, who had succeeded the aged Lieutenant-General Scott as commander-in-chief, commenced a movement on Richmond, the seat of the Confederate government, now defended by General Lee. On the 8th of March, the Confederate iron-clad *Virginia*, constructed from the U. S. steamer *Merrimac*, which had been sunk at Norfolk, and raised by the Confederates, attacked the Federal fleet in Hampton Roads, and in 40 minutes sunk the *Cumberland*, and set on fire and captured the

Congress (frigates); while the other vessels took refuge in shoal water or in flight. The next day, the *Monitor*, a war-vessel of entirely novel construction, low and flat, with a revolving turret, invented by Captain Ericsson, engaged the *Virginia*. The battle lasted two hours without result. On the 6th of April, a sanguinary but indecisive battle was fought near Coriuth, Alabama, the Federals being protected by gun-boats. Soon after, Admiral Farragut, with a fleet of 45 vessels, carried the forts at the mouth of the Mississippi river, and took New Orleans; while the armies and gun-boats captured the fortifications on the upper part of the river as low as Memphis, Tennessee. In the meantime, General McClellan had besieged and taken Yorktown, and fought his way up the peninsula of the James River, until within five miles of Richmond, when he was beaten in a series of sanguinary battles, and driven, with a loss, in six days, of 15,000 men, to the shelter of his gunboats; while Generals Banks and Pope, sent to co-operate with him in the Shenandoah Valley, were defeated and driven back by General "Stonewall" Jackson. On the 1st of July, the President called for 500,000, and August 4, 800,000 more men for the Federal army. Congress abolished slavery in the district of Columbia, prohibited it in the territories and passed a resolution to compensate the masters in any state that would abolish slavery. They also authorised the President to employ negroes in the army, and to confiscate the slaves of rebels. In August, the Federals were a second time defeated at Bull Run, and General Lee crossed the Potomac into Maryland, creating great alarm in Washington, and even in Philadelphia. General McClellan made a rapid march, and met him at Sharpsburg or Antietam. A drawn battle resulted in the retreat of General Lee, covering an immense train of provisions, horses, cattle, &c., which was probably the object of his expedition. A confederate invasion of Kentucky, about the same time, was attended with the same results. Another advance on Richmond was led by General Burnside, who had superseded General McClellan; but he was confronted by General Lee at Fredericksburg, and defeated in one of the most sanguinary battles of the war. President Lincoln issued a proclamation declaring the freedom of all the slaves in the rebel states, which it was expected might cause them to rise against their masters; but it was without result. While the army of the Potomac was vainly endeavoring to advance on Richmond, the army of Tennessee, under General Rosecranz, with its base at Nashville, was trying to sever the Atlantic from the Gulf States, and cut off the railways that supplied the Confederate armies in Virginia. At Murfreesborough, Tennessee, the Confederate General Bragg attacked General Rosecranz with the usual result of heavy losses on both sides, but no decided victory.

Early in May 1863, General Hooker, who had succeeded General Burnside in the command of the army of the Potomac, crossed the Rappahannock, and was defeated by General Lee at Chancellorsville with great slaughter; but this victory was dearly bought by the loss of General Jackson, mortally wounded in mistake by his own soldiers. General Lee now took the offensive, and invaded Pennsylvania, advancing as far as Harrisburg; but being met by General Meade, the new commander of the army of the Potomac, he attacked him in a strong position at Gettysburg without success, and was compelled to recross the Potomac. In the meantime, the two principal fortresses of the Mississippi, Vicksburg and Port Hudson, attacked by land and water, after a long siege, were starved into capitulation, and the entire river was open to Federal gun-boats. Charleston, blockaded since the beginning of the war, was now strongly besieged—its outworks, Forts Gregg and Wagner, taken, Fort Sumter battered in pieces, but still held as an earthwork, and shells thrown a distance of five miles into the inhabited part of the city. In September, General Rosecranz had taken the strong position of Chattanooga, and penetrated into the north-west corner of Georgia, where he was disastrously defeated by General Bragg at the battle of Chickamauga. At this period, there were great peace-meetings in the North, terrible riots in New York against the conscription and the negroes; while the banks having suspended specie payments, the paper-money of both Federals and Confederates was largely depreciated. The Confederates were, however, cut off from all foreign aid, except what came to them through the blockade, and their own resources, both of men and material, were becoming exhausted. The railways were worn, many destroyed or occupied by the Federals, and it became difficult to transport supplies, and feed armies. The Federals had command of the sea, and access to all the markets of Europe.

At the commencement of 1864, the Federals held, including the garrisons on the Mississippi, nearly 100,000 prisoners of war. The Southerners also had about 40,000 Federal prisoners, whom they could feed with difficulty, and who suffered great hardships. General Ulysses S. Grant, who had been successful at Vicksburg, was appointed commander-in-chief of the Federal armies, and commenced a vigorous campaign over an immense area—in Virginia, the Carolinas, Georgia, Louisiana, and Arkansas, with the determination "to hammer continuously against the armed forces of the enemy and his resources, until by mere attrition he should be forced to submit." Of the Confederates, General Lee defended Petersburg and Richmond, General J. E. Johnston opposed the army of Tennessee at Dalton, Georgia; General Forrest was in Mississippi; General Taylor and Kirby Smith commanded in Louisiana and Arkansas. In February, General Sherman marched from Vicksburg, making a destructive raid across Northern Mississippi to Alabama. In March, the Federals had 1,000,000 of men raised and provided for. The entire Confederate forces probably numbered 250,000. The army of the Potomac, commanded by General Meade, under the personal superintendence of General Grant, covered Washington, and advanced toward Richmond. General Butler advanced from Fortress Monroe up the James River; General Sigel marched up the Shenandoah. Sherman united the armies of Tennessee, Cumberland, and Ohio, at Chattanooga, where he had nearly 100,000 men and 250 guns. General Banks had 61,000 men in Louisiana. In March, General Banks moved up the Red River, toward Shreveport, but was defeated on the 24th, and driven back to New Orleans. In May, the campaign of Virginia commenced, and the army of the Potomac fought a series of battles at the Wilderness, Spotsylvania Court-house, Jericho's Ford, North Anna, and Cold Harbor, with terrible losses. After each repulse, the Federals took up a new position further south, with a new base, until they had made half the circuit of the Confederate capital. General Breckenridge defeated Sigel in the Shenandoah valley, and once more threatened Washington. General Sheridan, with a strong cavalry force, drove back the Confederates, and laid waste the valley. In September, General Sherman advancing with a superior force, captured Atlanta. General Hood, superseding Johnston in the command of the Confederates, was out-generaled and beaten. While he marched west to cut off General Sherman's base, and attack Nashville, where he was defeated, Sherman burned Atlanta, destroyed the railway, and marched boldly through Georgia to Savannah. The Confederates made strong efforts, and won victories, but with no permanent result.

In 1865, the Federals made a new draft for 500,000 men. Expeditions were organized against Mobile. Wilmington, the most important Confederate port, was taken by a naval and military expedition. Savannah and Charleston, approached in the rear by Sherman, were evacuated. Cavalry raids cut off the railways and canal that supplied the Confederate army in Petersburg and Richmond. Finally, on March 29, 1865, a series of assaults was made upon the Confederate works, during ten days of almost continual fighting, until the Confederates were worn down with fatigue. Richmond and Petersburg were evacuated April 2; and on the 9th, after several conflicts, General Lee surrendered at Appomattox Court-house, his army numbering 28,000. At this period, it is said that there was not lead enough remaining in the Confederate States to fight a single battle. On the 12th, Mobile surrendered with 8000 prisoners and 800 guns. Then General Johnston, in North Carolina, surrendered a few days after to General Sherman; and the Trans-Mississippi Confederate army followed his example.

The war was scarcely ended, when 800,000 men were paid off. During the war, the number of men called for by the Federal government was 2,759,049; the number actually furnished was 2,653,062. Of colored troops there were 166,097. The state of New York, with a pop. of less than 4,000,000, sent 223,836 volunteers. There was an annual waste of one-third, half of which was by wounds in battle. The Federal losses during the war were estimated at \$16,000. The statistics of the Confederate forces are imperfect; but in 1864, the army consisted of 90,000 artillery, 128,000 cavalry, 400,981 infantry; total, 549,226 men. The Confederate losses are unknown.

Mr Lincoln was in 1865 triumphantly re-elected to the presidency, with Andrew Johnson as Vice-president. On April 14, while the north was rejoicing over the capture of Richmond and the surrender of the Confederate armies, the President was assassinated at a theatre in Washington, by John Wilkes Booth, an actor;

while an accomplice attacked and nearly killed Mr. Seward, Secretary of State. The assassin was pursued and killed, and several of his accomplices tried and executed. Andrew Johnson became president. Jefferson Davis and the members of the Confederate government were supposed to be privy to the assassination of President Lincoln, and large rewards were offered for their apprehension. Mr. Davis was captured in Georgia, and placed in Fortress Monroe, but was released without trial in May, 1867. An amendment to the constitution, forever abolishing slavery in the states and territories of the Union, was declared ratified by two-thirds of the states, December 18, 1865.

A bitter struggle now began between President Johnson and Congress, which lasted to the end of his administration. It was caused by a disagreement regarding the terms on which the states lately in rebellion should be re-admitted to the Union. It culminated in the impeachment of the President "of high crimes and misdemeanors." The senate was formed into a high court of impeachment and proceeded to try him on eleven articles, the chief reason stated being his violation of the law by removing from office Mr. Stanton, Secretary of War, without the consent of the senate. The President, however, was acquitted, and consequently Mr. Stanton retired from office. The states of Arkansas, Alabama, Florida, North and South Carolina, Georgia and Louisiana, were not re-admitted into the Union until 1868. The vast changes in the organization of the republic made by the new fundamental law was completed by the 14th and 15th Amendments, which finally determined the status of the negro race as regards the right of suffrage, giving to the former slaves all the rights and privileges of citizenship. In 1867 the United States acquired by purchase the whole of Russian America (see ALASKA).

In 1860, Ulysses S. Grant, of Illinois, the Republican candidate, was inaugurated as President, with Schuyler Colfax, of Indiana, for Vice-president. In 1872, the Alabama (q. v.) Court of Arbitration met. This court consisted, besides the representatives of England and the United States, of three other members appointed by the King of Italy, the President of the Swiss Confederation, and the Emperor of Brazil. It met at Geneva, December 17, 1871, and gave its decision September 15, 1872. It was decreed by a majority of four to one that Great Britain should pay the United States \$15,500,000 in gold. The San Juan boundary dispute with Great Britain was settled on the same side by the Emperor of Germany. The construction of the Union and Central Pacific railroads was finished in 1869, completing the railroad across the continent. Great excitement was created in the states by the discovery, in connection with the part taken by the government in the construction of these roads, of grave malversations on the part of citizens holding high rank in the public service. The outrages of a secret organization known as the Ku-Klux-Klan, in the Southern States, attracted public attention about this time. For three years the press had been continually reporting outrages committed by the Democratic party in the South against the Republicans. The most fearful acts of atrocity are attributed to this terrible Ku-Klux-Klan, and assassinations of negroes were of daily occurrence. The freedmen were thus debarred from the exercise of their right of free suffrage. Congress at last appointed a committee to inquire into the affair, and consequently an act was passed giving cognizance of such offences to the United States courts.

In 1873, Grant was chosen President for a second term, with Henry Wilson, of Massachusetts, for Vice-president. Horace Greeley had received the nomination of the Democratic party, and his death, which occurred soon afterwards, must be attributed to disappointment, added to the fatigue and excitement resulting from the campaign. Disputes with the Indians on the north-west frontier resulted this year in the Modoc war. They were forced to surrender in 1873 by General Jefferson C. Davis. War with Spain seemed impending in 1873, the *Virginius* carrying men and arms for the revolting Cubans, but sailing under the American flag, having been taken by the Spanish steamer *Tornado* and 58 of her men shot. Both nations began preparing for war before a peaceable settlement was arrived at by negotiation. The year 1876, memorable in the annals of the republic as the hundredth anniversary of the Declaration of Independence, was celebrated by the great Centennial Exhibition at Philadelphia. It was open to visitors for six months, from May 10, to November 10, and during that time was visited by 2,910,966 people.

The presidential election of 1876 was of more than usual interest and importance.

The Republican candidate was Rutherford B. Hayes, and the Democratic Samuel J. Tilden. When the result of the keenly-contested election was made known, it seemed as if fortune had favored the Democratic party. But many of the returns from the various states were disputed, charges being made of fraudulent voting which raised doubts as to several votes in the electoral college. For several months the most intense excitement prevailed, and party feeling was so strong that many feared there would be no peaceable settlement of the dispute. At last it was agreed that the matter should be referred to a special tribunal consisting of five senators, five representatives and five judges of the Supreme Court of the United States. They proceeded to examine the election returns and, after hearing the statements of both parties, decided, by a vote of 8 to 7, that the votes in question belonged to Hayes, who was therefore declared to have been elected. He was inaugurated March 4, 1877. In 1877 there was some disturbance in Louisiana and South Carolina, rival candidates for the governorship claiming to be legally elected. The disputes, however, were at length amicably settled through the intervention of the president, and the United States troops were recalled from each state. The withdrawal of these troops was contrary to the policy of the Republican party, who claimed that the enfranchised negroes were thus left unprotected, but the wisdom of this action has since been acknowledged. In July, of this year, occurred the memorable railroad strikes. For two weeks there were "off strike" at the same time 100,000 railroad employees, and 40,000 miners, and 6000 miles of railroad, covering several of the principal lines, were in the hands of the mob. It was found necessary, in order to restore order, to call out the state militia and the United States army. The value of the property destroyed by the rioters has never been fully estimated. A movement was made in Maryland to further investigate the title of Hayes to the presidency, and Congress afterwards appointed another committee for the same purpose, but no changes in the government resulted from their inquiries. In 1878 a new and satisfactory treaty was made with China, facilitating more pleasant and intimate relations between the two countries, and a Chinese legation was established at Washington. A period of great commercial depression, not peculiar to America, reached its height in 1877, and was accompanied by alarming difficulties between labor and capital. In 1878 a measure was passed, in spite of the President's veto, making silver a legal tender equally with gold, though the former was then 11 per cent. less in value. A marvellous recovery in trade rendered comparatively easy in 1879 the resumption of specie payments, which had been strenuously opposed by the Democrats. An extraordinary movement took place amongst the negroes of the Southern States in 1879; a regular "negro exodus" northward and westward created some anxiety. During two weeks 2000 negroes left the States of Mississippi and Louisiana and made their way to Kansas, which seemed to be the goal the greater number wished to reach. How it happened that so many left at the same time has never been made clear. There seemed to be no organized plan, and all gave, as their reason for leaving the South, the hardships and want they had to endure owing to the tremendous prices exacted for rents and the continual murders of the negroes. This migration continued for some time, but not in such large numbers as to attract attention. Antipathy to the Chinese immigrants in the Pacific states raised a violent agitation, and a new constitution was passed in California, but the excitement subsequently declined. Bad harvests in Europe increased the already enormous exportation of grain from the United States. The wheat crop and exportation of 1880 were unparalleled, but the crop of 1881 was, owing to unfavorable weather, much diminished. In the beginning of 1880 there were political disputes in Maine, different governors being declared elected by opposition parties. It was feared for many weeks that civil strife would be the consequence, but the Republican governor was at last declared elected by the Supreme Court of the state.

In 1879, there was a Democratic majority in both Houses of Congress and a term of office seemed to the Democrats at last to be at hand. An item of special interest in the contest was the promotion of General Grant's claim to a third term of office. His nomination was opposed by most of the Republican party, but several states, among which were New York and Pennsylvania, gave special instructions to their delegations to vote in his favor. This made it impossible to secure the nomination of either Blaine or Sherman, but at last James A. Garfield, of Ohio, an

outspoken advocate of civil service reform, was agreed upon. The Democratic nomination was Winfield S. Hancock for President, and William H. English, of Indiana, for Vice-president. Although the "solid South" voted for General Hancock, the election gave a large majority for General Garfield with Chester A. Arthur, of New York, for Vice-president. To the horror of his fellow-citizens and of all the civilized communities in the world, the President was struck down, on July 2, by the hand of an assassin; but not till the 19th September did he succumb to the effects of the fatal shot. Thereupon the Vice-president, General Chester Allan Arthur, succeeded to the Supreme office, assuming the presidency on September 22, 1861.

UNITED STATES OF COLUMBIA. (See COLUMBIA.)

UNITED SYRIANS, an Eastern sect of the Roman Catholic Church. They are about 30,000 in number and have a patriarch called the patriarch of Antioch, 4 archbishops and 11 bishops. The sect has existed since the seventeenth century, at which time they left the Jacobites under the leadership of their first patriarch Andreas Achigian, and joined the church of Rome.

UNITIA, a hamlet in London Co., Tennessee, U. S. It is situated about 23 miles below Knoxville on the Tennessee River. It has 2 churches and the population in 1880 was 144.

UNITY a township in Columbia Co., Ohio, U. S., about 16 miles south-west of New Castle, Pennsylvania. The Pittsburg, Fort Wayne and Chicago Railroad runs through it. Pop. (1880) 3114.

UNITY, a township in Waldo Co., Maine, U. S., about 32 miles north-east of Augusta and 26 miles north-west of Belfast. It stands on a branch of the Maine Central Railroad and has two churches. There are manufactures of lumber, ploughs and starch. Pop. (1880) 1092.

UNITY, a township of Westmoreland Co., Pennsylvania, U. S., containing Pleasant Unity, Youngstown and Beatty. Pop. (1880) 4079.

UNITY, a township of Rowan Co., North Carolina, U. S. Pop. (1880) 815.

UNIVALVES, in Conchology, are those shells which consist of only one piece. They are mostly the shells of gasteropodous molluscs, but some cephalopodous molluscs also have univalve shells, as the argonaut and nautilus, and even animals belonging to other divisions of the animal kingdom, particularly a few annelids, as *Serpula*, and the *Foraminifera*. In systems of Conchology, when the shell alone was regarded, the usual division of U. was into *Unilocular* and *Multilocular*, the latter being the shells divided into chambers, as in the nautilus. The whole arrangement, however, was unnatural, bringing together in one group creatures widely different, and separating groups which in reality are very closely allied; for the mere presence or absence of a shell is often comparatively an unimportant circumstance, as in the case of snails and slugs. Yet by the mere shell, recent or fossil, the naturalist knows the group and order to which its occupant belonged, and can pronounce with confidence as to some of the habits of the animal. There are marked peculiarities in the U. of different geological periods, well known and of great interest to geologists. See **GASTEROPODA** and **MOLLUSCA**.

UNIVERSALISTS, a body of Christians whose distinctive peculiarity consists in their belief that "evil" will ultimately be eradicated from the world, and that all erring creatures will be brought back to God through the irresistible efficacy of Christ's divine love. The grounds on which their faith in the final salvation of all men rests are derived more, perhaps, from reason than from Scripture; and when they do appeal to the latter, it is rather to the spirit and design of the Gospel than to particular passages. They argue, that when an infinitely wise, holy, and benevolent God resolved to create man, it could only be with a view to his everlasting good; that if he did allow him to be tempted and fall, it must have been because he foresaw that through sorrow and suffering man could rise to higher degrees of perfection; that therefore all punishment (or what, with our limited knowledge, we conceive to be such) is of necessity designed as a remedial agent, and not intended to satisfy God's

indignation as a sovereign at the disobedience of his subjects; that no other view of the subject is compatible with the Scriptural, and especially the New Testament representation of God as a "Father," or with the oft-repeated declaration (in various terms) that Jesus Christ was a propitiation for the sins of the whole world. In answer to those who adduce against them the express language of Scripture; e. g., "And these shall go away into everlasting punishment: but the righteous into life eternal" (Matthew, xxv. 46), they reply, that the word *aiónios*, translated "everlasting," does not necessarily bear that signification; that properly it does not express the idea of duration at all, either finite or infinite, but was rather used by the sacred writers to denote a mode of existence distinct from and wholly dissimilar to any mere *chronic* state; in proof of which they point to such passages as—"This is life eternal, that they might know thee, the only true God, and Jesus Christ, whom thou hast sent" (John, xvii. 3), where eternal life is affirmed to be *knowledge*—that is, a present state of mind, and not a perpetual hereafter of duration.

U., it may be observed, generally differ from the prevalent bodies of Christians in other important doctrines, though it is not because of such differences that they have received their name, nor is it necessary to merit the name that one should share these differences. Most of them agree with Unitarians—but there are eminent examples to the contrary—in rejecting the doctrine of the Trinity; they are also Pelagian in the matter of original sin, and reject the notion that the new birth is something supernatural.

Universalism, as a mode of belief, is of very ancient origin, and its modern adherents, besides urging its congruity with the diving plan of redemption, as revealed in Scripture, point to the earliest Christian writings; e. g., the "Sibylline Oracles" (150 A.D.—see *SIBYL*)—expressly composed to convert pagans to Christianity—as evidence that the doctrine was recognised from the first. Passages in favor of the doctrine are cited from many of the church fathers—Clemens Alexandrinus; Origen; Marcellus, Bishop of Ancyra; Titus, Bishop of Bostra; Gregory, Bishop of Nyssa; Didymus the Blind, president of the Catechetical School of Alexandria; Diodorus, Bishop of Tarsus; Theodoret, Bishop of Mopsuestia; and Fabius Marius Victorinus. It is said to have been held by some of the Albigenses and Waldenses, the Lollards and Anabaptists, and it probably had isolated supporters in most of the countries into which the Reformation penetrated. Nor has it wanted illustrious adherents belonging to the Church of England and the Non-conformists, among whom it is customary to rank Archbishop Tillotson, Dr Burnet, Bishop Newton, Dr Henry More, William Whiston, Jeremy White (chaplain to Oliver Cromwell), Soame Jenyns, David Hartley, William Law, and (in our own day) Thomas de Quincy and Professor Maurice. The same remark is applicable to the French Protestant and German Churches, and indeed it may safely be asserted that the *non-clerical* mind in all ages is disposed to look favorably upon the doctrine of the universal restoration to holiness and happiness of all fallen intelligences, whether human or angelic. Hence the irrepressible sympathy of men, however orthodox, with the language of Burns:

Then, fare ye weel, auld Nickie Ben.
Oh, wad ye tak a thocht, and men',
Ye ablinus micht—I dinna ken—
Still hae a stake.
I'm wae to think upo' yon den,
E'en for your sake.

But the existence of U. as a distinct religious sect is a feature of American rather than of English religious society. About the year 1770, the Rev. John Murray became a propagator of Universalist views; and since his time, an organised body has sprung up, which contains many able, learned, and pious divines. According to the "Register" of the denomination published in 1871, there are in the United States, 304 societies, owning 637 churches, and ministered to by 621 preachers. These societies have under their patronage 11 institutions of learning, including 4 colleges and 7 academies, and they support 13 periodicals. Various missionary, tract, and Sunday school associations are also employed in teaching and propagating their peculiar views.—See "Ancient History of Universalism," by the Rev. Hucsa

Ballou; and the "Modern History," by the Rev. Thos. Whittemore (Bost. 1880; new. edit. 1860 et seq.).

UNIVERSAL LEGATEE is a legatee to whom the whole estate of a deceased party in Scotland is given, subject only to the burden of other legacies and debts. It nearly corresponds to residuary legatee in England.

UNIVERSITY (Lat. *universitas*, corporation), a corporation of teachers or students instituted for the promotion of the higher education. Mr Kirkpatrick, in his "Historically Received Conception of a University" (Lond. 1857), points out the prototype of the universities of modern Europe in the schools of Isocrates and Plato at Athens, and the Museum at Alexandria. These institutions certainly much resembled the university of after-times, both in their objects and their organisation; and in Greece and Rome, as well as in the later Byzantine Empire, something analogous to the degree was conferred on those who had successfully passed through the *trivium* or *quadrivium*, which together comprised what was regarded as the seven liberal arts and sciences. The university is, however, usually considered to have originated in the 12th or 13th c., and to have grown out of the schools which, prior to that period, were attached to most of the cathedrals and monasteries, providing the means of education both to churchmen and laymen, and bringing together the few learned and scientific men who were to be found in Europe. Such an institute of the higher learning was at first called *studium* or *studium generale*. When a teacher of eminence appeared, such as Abelard or Peter Lombard at Paris, or Irnerius at Bologna, a concourse of admiring students flocked round him; and the members of the *studium generale* formed themselves, for mutual support, into a corporation, on which the general name of *universitas* came to be bestowed. In this way, the oldest universities arose spontaneously. The crowds drawn from every country of Europe to Paris, Bologna, and other educational resorts, had first local immunities bestowed on them for the encouragement of learning, and to prevent them removing elsewhere; and the academical societies thus formed were by papal bulls and royal charters constituted on integral part of the church and state. One great difference existed between the constitution of the two most important universities of early times. In Paris, the teachers alone constituted the corporation; in Bologna, the university consisted of the students or scholars, who at first held the supreme power, and appointed the academic officials. In this respect, Bologna became the model of the subsequent universities of Italy and the provincial universities of France, which were corporations of students; while the universities of Britain, Germany, Holland, and Scandinavia were like Paris corporations of teachers, and the Spanish universities occupied an intermediate position. Along with a general resemblance, there was much difference in the constitution and character of the pre-Reformation universities, the form of each being the result of a combination of various circumstances and ideas acting on an originally spontaneous convocation of teachers and scholars.

The several *faculties* of a university are subordinate corporations, consisting of the aggregate of students or teachers in a particular department of knowledge. The number of faculties has varied much in different universities. The university of Paris had at first only a faculty of arts, which, as early as 1169, existed as a separate body, with an organisation of its own. Faculties of theology, medicine, and canon law were added in the 13th century. Bologna was at first exclusively, as it continued to be pre-eminently, a school of law. Oxford and Cambridge, in their origin, existed only in the faculty of arts. Some of the smaller French universities, as Orleans and Montpellier, were prohibited from teaching theology, lest they should become rivals to Paris.

The granting of degrees was the mode in which the university reproduced itself. A degree is the recognition of a student having made a certain advance in his career, the degree of Doctor or Master, in its original idea, entitling the person on whom it was conferred to teach within the limits of the university. Towards the end of the 13th c., Pope Nicholas I. granted to the university of Paris the right of endowing its graduates with the power of teaching everywhere; and this universal degree, making the recipient of it a member of the community of the learned throughout Christendom, became a link of connection between the universities of Europe. The designation of *Bachelor* borrowed from the term indicating the pro-

bationary stage of knighthood, and implying the lowest stage of university honor, or the condition of an imperfect graduate, was first introduced in the 13th c. in the university of Paris, where the bachelor, though intrusted with certain tutorial functions, possessed no legislative power. The right of teaching (*regent*) belonged to the master, doctor, or other perfect graduate; and a period of necessary regency was generally fixed, during which the graduates were bound to teach, and after the expiry of which they were at liberty to become non-regents. It, in the course of time, became the practice to endow a select number of the graduates as public authorised teachers; these privileged and salaried graduates were designated *Professors*, and instruction by professors more or less supplanted the original plan of teaching by graduates.

The poverty of a proportion of the students, and the desirableness of domestic superintendence, suggested the institution of halls endowed with property and corporate privileges, called *Colleges*. Though originally a provision for poor scholars, they soon assumed the character of boarding-houses for all classes of students, where they were privately trained and prepared for the public lectures. Colleges seem to have been first introduced in Paris, where most of them became appropriated to a particular faculty, or department of a faculty. The college of the Sorbonne, founded in 1250, came to be in a great measure identified with the theological faculty. Regent masters were named by the faculties as lecturers in the colleges, attendance on whom was made equivalent to attendance on the public courses in the schools of the university, and eventually the college lectures were thrown open to all members of the university; and it became obligatory in the faculty of arts, and usual in the other faculties, to become a member of some college.

The two highest university officers have generally been the *Rector* and the *Chancellor*, the former being the head of the university in everything except the granting of degrees, which are conferred by the latter as the fountain of honor. Besides the division into faculties, there was in most of the continental universities a division of the graduates and students into *nations*, in respect of the countries to which they belonged. In Paris, the faculty of arts was divided into four nations, known as French, Picard, Norman, and German or English; and after the 13th c., these four nations, under their respective procurators, and the three subsequently added faculties under their deans, constituted the seven component parts of the university. The rector, with the procurators and deans, formed a court having cognizance of all matters relating to discipline, from which there was an appeal to the university, and from thence to the parliament of Paris. In Bologna, after faculties of philosophy, medicine, and theology had been added to those of civil and canon law, the students were classed as *ultramontani* and *citramontani*, and each class divided into nations, presided over by their several counsellors or procurators.

The university, with modifications called for by the altered circumstances of society, has survived the revolutions of seven centuries. At present, Europe possesses about 100 universities, some dating from the 12th and 13th centuries, and others of various degrees of antiquity, including some founded in the present century. About 50 belong to Germany, and 30 to Italy; Holland, Belgium, Scandinavia, Spain, Portugal, Russia, and Greece contain among them about 30 universities. England has four—two ancient, Oxford and Cambridge; and two modern, London and Durham. Scotland has the four universities of St Andrews, Glasgow, Aberdeen, and Edinburgh; and Ireland has Trinity College, Dublin, and the three affiliated colleges of the Queen's University.

Of the universities of Germany, the oldest are Prague, founded in 1348, and Vienna, in 1365. Heidelberg dates from 1386; Leipzig, 1409; Tübingen, 1477; Jena, 1558; Halle, 1694; Göttingen, 1737; Berlin, 1810; and Bonn, 1818. The chief administrative body of the German universities is the *Senatus Academicus*, composed of the ordinary professors, presided over by a rector elected yearly, or (at Halle and Tübingen) by a chancellor appointed for life, the exercise of discipline being, however, intrusted to a separate court, presided over by a judicial officer called the *Syndic*. There is a recognised gradation in the professorial office. The highest class are *ordinary professors*, generally men of considerable eminence in their respective departments, elected by government out of three candidates submitted by the faculty to which they belong. Next to them are the *extraordinary professors* of the same

branches, with smaller salaries; and then the class of *privat-docents*, who, in the course of time, qualify themselves to be extraordinary professors. An ordinary professor must deliver public lectures on the branch to which he is appointed; an extraordinary professor, or *privat-docent*, may lecture on what subject he pleases. The student is for the most part at liberty to attend what lectures he pleases; but licences to practice certain professions, benefices in the church, and other posts, are only given to persons who have gone through a certain course of university study. In addition to the above-mentioned classes of instruction, there are attached to the university teachers of modern languages and other branches not forming part of the curriculum. The *Bursae*, foundations resembling in their origin the English colleges, and the *Convict*, or free table, are institutions for the benefit of the poorer students, from the former of which is derived the name *bursche*, popularly applied to a student in Germany. The German university system is admirably adapted to promote the advancement of science; its deficiency is chiefly in appliances for superintending the progress of the individual student. The professor is often more an instructor of the world at large by his writings, than of his students by his lectures.

The two great English universities are little inferior in antiquity to Paris and Bologna. From the beginning of the 12th to the middle of the 14th c., Oxford played nearly as important a part in the advancement of science and political life as Paris itself, with which it was connected by intimate ties, the most eminent doctors of Oxford acting at the same time as regent-masters in Paris. It espoused the cause of the barons against the crown, and while preserving an intimate relation with the church, generally sided against ecclesiastical abuses. Oxford and Cambridge, not unlike the continental universities in their origin, developed themselves in a manner peculiar to England. From an early period, it was the practice of the students to live in common in halls or hostels, rented from the burghers, under the charge of a common teacher. In 1280, there were no fewer than 34 halls at Cambridge, some containing as many as 20 to 40 Masters of Arts, and a proportionate number of younger students. In the course of time, colleges were endowed by benevolent persons for the maintenance of the poorer students, and the name *socii*, or *fellowes*, was applied to the recipients of the endowments. This assistance was originally meant to last no longer than the completion of the course of study; but as most of the *socii* belonged to the ecclesiastical order, and had no other means of support, an understanding gradually arose that the aid furnished by the college should be continued to the *socius* till he succeeded in obtaining a benefice. These provisions gradually increased in number and importance; and a practice was introduced of the colleges receiving wealthier students as boarders—the origin of the class of commoners or students not on the foundation. Most of the halls fell into decay, and those that remained received a collegiate character. In the 15th c., fellowships were no longer endowed to assist students going through their course of study, but as a permanent provision for poor young men of the clerical order who shewed a taste for learned pursuits, and the degree of Master was made a necessary condition for holding them. In this way, the colleges became the university; the university acquired a semi-monastic character, which has since more or less adhered to it; and a tutorial system of education within the colleges was almost entirely substituted for instructions by university professors. For two centuries, the staff of professors have had little to do with academical education or discipline. The instruction of the student is committed to college tutors, assisted by private tutors, and attendance on the professors is in general neither required for university rank nor for college emoluments. The tutorial system is defended on the ground of its giving the instructor a greater hold over the student's attention. On the other hand, it lacks the advantages arising out of the division of labor in the professorial system; and it is now generally allowed that a mixture of both systems of teaching is better than either alone. An effort has been made by the new statutes to render the professorial office in Oxford and Cambridge rather less of a sinecure than formerly. One of the most remarkable features of the English universities is their wealth in endowments. According to the "Universities Commission Report" (1874), the annual revenue of Oxford and Cambridge amounts to about £750,000, of which endowments provide £614,000. For the mode of government, see CAMBRIDGE, OXFORD.

Of the two modern English universities, London University (q. v.) was established by royal charter in 1826. Durham University was opened for students in 1833, and obtained the right of conferring degrees by royal charter in 1837. The general provisions for education are similar to those of Oxford and Cambridge, and there is also a course of theological study. In 1837, a course of instruction was added in mining and civil engineering. The university of Dublin (q. v.), founded in 1591, consists of a single college, named Trinity, with a constitution similar to the colleges of Oxford and Cambridge; but the professorial element is to a large extent united with the tutorial.

The universities of Oxford and Cambridge have since 1603 returned two members each to parliament; the university of Dublin has the same privilege; while London University elects one.

The universities of Scotland, mostly founded in the 15th c., approached much more nearly to the type of Germany and the Low Countries than of England. The teaching as well as governing body were the professors; and the college was a building for the accommodation, not of the students or fellows, but of the professors, as public lecturers. Though nearly all the students were Scotchmen, they were nevertheless divided, according to continental usage, into four nations, named from the parts of Scotland to which they belonged. In St Andrews, there were from the first the separate faculties of divinity, arts, and canon law. A *pædagogium* was erected in 1430 for the faculty of arts. In 1450, Kennedy, Bishop of St Andrews, established and endowed the college of St Salvator, to which Pope Paul II. accorded the privilege of conferring degrees in theology and the arts, constituting it to that effect a separate university. St Leonard's College was founded in 1512, and St Mary's in 1537, with power of conferring degrees. After the Reformation, St Mary's was restricted to the study of theology; and in 1747, St Salvator and St Leonard were united. Glasgow had its lecturers in canon and civil law, and theology, from the beginning. The faculty of arts, however, always received a definite shape and constitution; it had, as St Andrews, a *pædagogium*; and prior to the Reformation, had nearly absorbed the university. During the Reformation period, Glasgow University was nearly annihilated; but it was restored by the exertions of Queen Mary and James VI. "The university of Aberdeen, as now constituted, derives its origin from two different foundations—one, the university and King's College of Aberdeen, founded in 1494 by William Elphinstone, Bishop of Aberdeen, under the authority of a papal bull obtained at the instance of King James IV.; the other, Marischal College and University of Aberdeen, founded in 1593 by George Keith, Earl Marischal, by a charter ratified by act of parliament" ("Aberdeen University Calendar"). By the Universities (Scotland) Act, 1858, King's and Marischal College have been incorporated into one university and college, as the university of Aberdeen—King's College being reserved for the faculties of arts and divinity, and Marischal College for law and medicine. The university of Edinburgh, founded after the Reformation, had but little of the ancient university character, being a professorial seminary on a royal foundation, rather than a society of graduates or students. James VI.'s charter of foundation placed it in the hands of the magistrates of the city, who remained its patrons till 1856. Besides a large number of small bursaries, there are now a few more considerable scholarships at the Scotch universities; but the endowments of this kind are still inconsiderable, compared with those of the universities of England.

The Scotch universities have been much modified in various respects by a statute passed in 1858. For some time previous, there had been a growing conviction that they were not keeping pace with the intelligence of the country. The absence of sufficient preparation on the part of the students obliged the professors of languages and mathematics to discharge inefficiently the functions of schoolmasters rather than their proper duties. Scholarship had declined, and a Scottish degree in arts had fallen into disrepute. These evils were sought to be cured by establishing an entrance examination, by grafting a certain amount of the tutorial on the professorial element, and by raising the standard of examination for degrees, so as to make them objects of ambition. The act of 1858 placed the Scottish universities under the superintendence of a Board of Commissioners for the space of four years, who had power to carry the statutory provisions into effect. A uniform constitution was given to all the universities, each of which has now three governing bodies, the

Senatus Academicus, the University Court, and the General Council; the chief officers being the chancellor, the vice-chancellor, and the rector. The *Senatus Academicus*, composed of the principal and professors, superintends the teaching and discipline, and administers the property and revenues of the university, one-third being a quorum, and the deliberations being subject to the control or the University Court. The principal presides, and has both a deliberative and a casting vote. The *University Court* consists of the rector, the principal, and assessors named by the chancellor, rector, General Council, and *Senatus Academicus* (in Edinburgh, the Lord Provost, and an assessor elected by the town-council, are also members of the court). The rector is president, with a deliberative as well as a casting vote. The rector, and the assessor nominated by him, continue in office for three years; the other assessors for four years. The functions of this body include the reviewing of the decisions of the *Senatus*, the regulation of the internal arrangements of the university, in conjunction with the *Senatus*, the chancellor, and the University Court; and the exercise of patronage to the chairs whose patronage was formerly in the *Senatus*. The *General Council* consists of the chancellor, the members of the University Court, the professors, masters of arts, doctors of medicine who have attended four sessions, and all persons who, prior to August 1861, produced evidence of attendance for four complete sessions, two of them being in the faculty of arts. The Council meets twice a year, the chancellor, whom failing, the rector, or principal, or senior professor present presiding, with a deliberative and casting vote. The duties of the Council are not legislative, but only deliberative; it may entertain any question affecting the university, and make representations regarding them to the University Court. The chancellor is elected by the General Council, and holds office for life; he appoints a vice-chancellor, who may act for him in conferring degrees, which is his principal function. The rector is elected by the matriculated students, and holds office for three years. At Edinburgh, the patronage of those chairs which were in the gift of the town-council has been transferred to seven curators, three of them nominated by the University Court, and four by the town-council. Entrance examinations have been instituted in all the universities, and assistants appointed to several of the professors, with functions somewhat analogous to those of tutors in England. The degrees now conferred in the Scotch universities are Master of Arts, Bachelor of Divinity, Bachelor of Laws, Bachelor of Medicine, Master in Surgery, and Doctor of Medicine; besides Doctor of Divinity and Doctor of Laws, which are purely honorary. Edinburgh grants, in addition, the degrees of Bachelor of Science and Doctor of Science, and Glasgow that of Bachelor of Science. The degree of Bachelor of Arts is not now given in any of the universities of Scotland.

The universities of Edinburgh and St Andrews, and the universities of Glasgow and Aberdeen, form two constituencies, each represented by one member of parliament.

See Savigny, "Geschichte des Römischen Rechts im Mittelalter;" Buzès, "Historia Universitatis Parisiensis;" Crevier, "Histoire de l'Université de Paris;" Mulden, "History of Universities and Academic Degrees;" Kirkpatrick, "Historically Received Conception of a University;" Huber, "History of English Universities;" Wood, "History and Antiquities of Oxford;" Dyer, "History of the University of Cambridge;" "Reports of Royal Commissions concerning the Universities of Scotland;" "Report of Commissioners on Oxford and Cambridge Universities."

UNIVERSITY COLLEGE, the oldest college in the university of Oxford, is said to have been founded as early as 872 by Alfred the Great. It was restored by William of Durham, rector of Wearmouth, who, at his death, in 1249, left a sum of money to form a permanent endowment for a certain number of "masters," preference being given to those who were born nearest the city of Durham. Among the subsequent benefactors are found King Henry IV., who founded (1403) three fellowships, at the request of Bishop Skirlaw of Durham (who consequently is also ranked as a "benefactor"); Henry Percy, Earl of Northumberland, who founded (1442) three fellowships; Sir Simon Bennet, Bart., who founded (1631) four fellowships and four scholarships; &c. In 1714, Dr John Radcliffe attached to this college two fellowships, tenable for 10 years by Masters of Arts, who must travel abroad during 5

University
Upanishad

140

years. The present foundation consists of 1 master, 18 fellows, 12 scholars, and several exhibitioners. The patronage consists of 10 livings.

UNIVERSITY OF FRANCE. In France, since the Revolution, the word University has acquired a meaning widely different from that which it bears in other countries; the expression "*Université de France*" being nearly equivalent to "National system of education of France." All the old universities of the country having been swept away at the Revolution, education had fallen into abeyance. After various attempts at the establishment of primary, secondary, and central schools in the departments, the imperial government adopted a new system, by which the whole educational machinery of the country was centralised at Paris, and committed to a body called the University, with a Grand-master at its head, assisted by a council. The system has since undergone various alterations. The governing body, as well for the higher educational institutes as for the elementary schools, is the Ministry of Public Instruction, supported by a supreme educational council and 18 inspectors-general. France is divided into 16 educational districts, the so-called *Académies*, within the bounds of which exist one or more of the *Faculties* of theology, law, medicine, and science and literature. Such faculties are found in 18 towns besides Paris; but only in the latter are the five co-existing faculties organised into a university. The monopoly, hitherto enjoyed by the U. of F., of opening schools of law and medicine, and of conferring degrees, was abolished by a law passed in 1875.

UNKIAR-SKELESSI, a small town on the Asiatic shore of the Bosphorus, in the neighborhood of Scutari, gives its name to a treaty concluded between Turkey and Russia, July 8, 1833. This treaty, which consisted of six articles, was one of mutual defensive alliance; but a separate and secret article was subjoined, by which the sultan, in place of the military or naval aid which, by the first article of the treaty, he was bound to furnish to Russia, agreed to close the Strait of the Dardanelles, allowing no foreign vessels of war to enter it under any pretext whatever. In consequence of this treaty, Russia landed 15,000 men at Scutari, and stopped the victorious career of Ibrahim Pasha (q. v.). The secret article was soon after divulged to Britain and France, both of whom regarded the treaty with dislike; and by the terms of that concluded at London, July 13, 1841, the stipulations of U. were annulled.

UNLEAVENED BREAD, Use of, in the Eucharist, has long been a subject of controversy between the Latin Church on the one hand and the Greek and other oriental churches on the other; with the latter of whom the Reformed churches in later times have conformed in their practice of celebrating the Lord's Supper. The early history of the usage is very obscure; but the Western Church had certainly, from a very remote date, employed *Azyme*, or unleavened bread, in the consecration and distribution of the Eucharist; nor was this usage made a subject of controversy with the Latins by Photius, on occasion of the dispute between the churches, which arose during his patriarchate. In the later controversy, however, under Michael Cerularius (see GREEK CHURCH), the question of azyme became very prominent, and the diversity of practice still continues a subject of controversy between the Greeks and Latins. The principal argument alleged by the advocates of the use of leavened bread, is founded on the assumption that the Last Supper of Our Lord took place on the eve of the Passover, that is, on the 13th day of the month Nisan, on which day common bread, and not the azyme, must have been used; and on this and some other grounds, some writers, even among the Roman Catholics themselves, and especially the learned Jesuit Sirmond, have maintained that the Last Supper was actually celebrated in leavened bread. On the other hand, however, it is contended that the Last Supper, being held in the evening of that day, was, in the strictest sense, Our Lord's celebration of the Passover, and therefore (Exodus, xii. 8-20), that the bread can have been no other than azyme, or unleavened. It must be added that all Roman Catholic writers, and the more learned among the Greeks, are agreed that the Eucharist may be *validly* consecrated whether the bread be leavened or unleavened.

UNNA, a small town of Prussia, in Westphalia, 19 miles north-west of Arnsberg. It was formerly fortified, was one of the Hanse Towns, and played a rôle in the history of the Feisengerichte (q. v.). About a mile to the north are the famous salt-works

of Königsborn, which yield 120,000 cwts. of salt annually. Pop. (1871) 6915, who are employed in weaving linen and hosiery, and in brewing and distilling.

UNST, the most northern of the Shetland Islands, in lat. $60^{\circ} 45'$ n., is 12 miles long, and $3\frac{1}{2}$ miles in average breadth; area, $86\frac{1}{2}$ sq. m.; pop. (1871) 2768. The coast is much broken, and the headlands are rocky, mural, and lofty. There are 2000 acres under cultivation, and about as many in pasture. Valuable minerals abound, and chromate of iron is an article of commerce. The island contains numerous tumuli, a chain of Scandinavian dunns, and the ruins of upwards of 20 ancient chapels. Fishing and agriculture are the chief employments.

UNTERWALDEN, one of the four Waldstätten, or Forest Cantons of Switzerland, forms part of the Hill Country which surrounds the Lake of Lucerne (see SWITZERLAND). It is 25 miles in length by 21 miles in breadth, and has an area of 297 sq. miles. In 1860, the pop. was 24,932; in 1870, it was 26,176. U. is bounded on the e., s., and w. by lofty hills, and subsidiary ridges divide it into two parallel valleys—both of which open on the north into the Lake of Lucerne. The eastern valley is drained by the Engolberger Aa, the western by the Sarner Aa. Great highways run up these valleys from the shores of the lake, and in several places communicate with each other; but they do not connect U. with surrounding cantons. The canton is chiefly pastoral. Some attempts have been made to cultivate the vine, but they have not proved successful. The language of the people is a Swiss-German dialect; their religion is Roman Catholic. U. is divided into two parts; not, however, corresponding with the two river basins of which it is formed. The forest of Kerns, or Kernwald, formed the line of separation between these two districts, which were separate so early as 1150. One is named the Obwald, or district above the Forest, and includes the whole of the western valley. The other is the Nidwald, which includes only the lower part of the eastern valley. Each division forms an independent republic, with its own administration. Both have a *landesgemeinde*, or parliament, composed of all the inhabitants 20 years of age, with the exception of a few *heimathlosen* (tramps); and each forms a half-canton, that is, a canton that returns one member to the Swiss Council of State. The *landesgemeinde* of each half-canton assembles in the open air late in the spring, when it passes new laws, pays off accounts, imposes taxes, and appoints the executive officers. The capital of the Nidwald is Stanz (pop. in 1870, 2070), remarkable for its fine church and statue of Winkelried. The capital of the Obwald is Sarnen, with a population of (1870) 3720.

UPANISHAD is the name of those Sanscrit works belonging to the Vedic literature which contain the mystical doctrine of the Hindus on the nature of a supreme being, its relation to the human soul, and the process of creation (see INDIA, sec. Religion). The word (derived from the Sanscrit prefixes *upa*, "beneath," or "near," and *ni*, "in," combined with the radical *sad* "sit") is explained by the great theologian *S'ankara* (q. v.), and others after him as meaning the "science of Brahman," or "the understanding of the identity of Brahman and the soul," because "in those devoted to it, this science *sits to rest* (or destroys) the world, together with (ignorance) its cause;" or, in other words, because it shows to them that the world has, besides Brahman, no reality. Grammatical commentators explain its etymology as implying that "eternal bliss *reposes on it* (*upanishidati s'reyo 'ayam*);" and Professor M. Müller has surmised that the word "Upanishad meant originally the act of sitting down near a teacher, of submissively listening to him," whence it came to mean "implicit faith, and at last truth or divine revelation." But apart from the artificialness of all these interpretations, it deserves notice that the earliest sense of the word appears to be that of "secret" or "mystery" (literally, "that which *sits or rests beneath*"). In this sense, it is mentioned by the grammarian Pāṇini; and as it is very probable that, in his time, the works bearing the name of Upanishads were not yet in existence (see Goldstücker's "Pāṇini," &c., p. 141), it may be assumed that these works derived their name from the mysteriousness of the doctrine contained in them; and perhaps also from the mystical manner in which they propounded it.

In order to understand the origin and purport of the Upanishads, as well as the relation in which they stand to the Vedas, properly so called, it must be borne in mind that, though the Vedic hymns are based on the worship of the elementary powers, and the Brāhman's portion connected with them is chiefly concerned in legendary and ritual matter relating to that worship, yet in both these portions of

the Vedas, and especially in the Brāhmanas, the beginnings of a period become already visible when the poets raised the questions as to the origin of the world and the true nature of the gods. See INDIA, sec. Religion. A first attempt at a systematic answer to these questions was made in works which bear an intimate relation to the Brāhmanas; and so great was the awe in which, on this account, these works were held, that they had to be read in the solitude, where the mind could ponder in perfect calmness over the mysterious problems in which they are engaged. These are the *Araṇ'yakas* (from *araṇ'ya*, a forest). But as the style and contents of the Araṇ'yakas are extremely obscure, and as, through the close alliance of these works to the Brāhmanas, of which some of them form part, the theological questions of which they treat are much overlaid with ritual and other matters which properly belong to the Brāhmanas, a further progress made in the same direction, led to the composition of works and treatises, the diction of which is somewhat clearer, and less entangled with subjects extraneous to the problems they intend to solve. Such works and treatises are the *Upanishads*. Their object, like that of the Araṇ'yakas, is to impress the mind with the belief in one Supreme Spirit (*Brahman*, as a nenter, and different, therefore, from the same word as a masculine, which is the name of the first god of the *Trimūrti*, q. v.), to shew that this Supreme Spirit is the creator of the world; that the world has no reality if thought of besides Brahman, and that the human soul is identical in nature with that same Spirit whence it emanates. The reward the Upanishads hold out to the believer, who understands their doctrine, and firmly adheres to it, is freedom from Transmigration (q. v.), and consequent eternal bliss. The object and aim of the Upanishads are therefore the same as those propounded in the philosophical systems (see SANSKRIT, sec. Literature); and the Upanishads may therefore be looked upon as the forerunners of these systems themselves—those Upanishads, at least, which we may call the older Upanishads; for as to the more recent ones, and those which bear the stamp of a sectarian character, their claim to be ranked among the Vedic writings is extremely doubtful, if at all admissible.

Though agreeing in the main points of their doctrine, it is easily understood that works of this nature, ranging over different periods of Hindu religion, will so differ from one another both in the manner and detail in which they deliver their subject-matter, and in the degree of completeness with which they treat of it. Thus, in some, the legendary narrative, and even ritual detail, are still considerably blended with the theosophical speculation—and these stand nearest, therefore, the Araṇ'yakas, probably also in time; in others, more philosophical, the nature of Brahman and the human soul is the only subject of inquiry; in others, the process of creation is also enlarged upon, with detail which harmonises more or less either with the interior views of the Vedānta (q. v.) or those of the Sāṅkhya (q. v.) philosophy; some Upanishads, again, especially emphasise the insufficiency, for the attainment of eternal bliss, of the performing religious acts and of worldly studies—the knowledge of Brahman being the only means that leads to this end; others, on the contrary, in conformity with the Yoga (q. v.) doctrine, assign a prominent place to the exterior means, by using which the soul would qualify itself for union with the Supreme Spirit; while the sectarian Upanishads, which identify this Spirit with Vishnu and Śiva, have, besides, the tendency of reconciling the popular with the philosophical creed.

Of the older Upanishads, a typical instance is furnished in the "*Chhāndogya*" Upanishad of the Sāmaveda, the framework of which is legendary throughout, and its contents allegorical and mystical. Other shorter Upanishads, freer from narratives and allusions to the mysterious import of ritual acts, aim at a more intelligible exposition of the doctrine of the soul. Of their mode of treatment, the following passage from the "*Kāṭhaka*" Upanishads will serve as an example: *Nachiketas*, the son of Vājaśravas, having come to the abode of Yama, the judge of the dead, and obtained from him the grant of three boons, asks of him, for his third boon, an answer to the following question: "There is this doubt: some say that (the soul) exists after the death of a man (in connection with another body than this); others say that it does not. This I should like to know, instructed by thee." And Yama, after some hesitation, explains to him that the soul and Brahman are one, but that a man attains immortality only by understanding this unity, and that, to arrive at this understanding, he must free his mind from sensual desires, and get a correct

knowledge both of the nature of Brahman and of the soul. "Know the soul as the rider, and the body as the car; know intellect as the charioteer, and *manas* (the organ of volition) as the reins. The reins, they say, are the horses, the objects (their) roads; and the enjoyer (i.e., the rider) is (the soul) endowed with body, senses, and *manas*. Thus say the wise. If he (the charioteer) is unwise, and his *manas* is a ways unbridled, his senses are uncontrolled like vicious horses; but if he is wise, and his *manas* is always bridled, his senses are controlled like good horses. He who, always impure, is unwise, and whose *manas* is unbridled, does not attain that abode (of immortality), but comes to the world (of birth and death); he, however, who, always pure, is wise, and whose *manas* is bridled, he attains that abode whence he is not born again. The man who has a wise charioteer, and whose *manas* is bridled, reaches the other shore of the road (of the world), the highest abode of Vishnu. Higher (i.e., subtler), indeed, than the objects are the senses; higher than the senses is *manas*; higher than *manas*, intellect; and higher than intellect, the great one, the soul. Higher than the great one is that which is unmanifested, and higher than the unmanifested is Purusha, the supreme spirit. But higher than Purusha there is nothing; he is the goal, the highest resort. The highest spirit is the soul hidden in all created beings; it is not manifest, but is beheld by those who can see what is subtle with an attentive, subtle intellect." The coincidence between the allegory, in the foregoing passage, and that in Plato's "Phædrus," imparts an additional interest to this Upanishad, which is valuable, moreover, on account of the evidence it affords as to points of agreement and difference between its views of the development of the world and those expounded in the Sāṅkhya (q. v.). The "Mundaka" Upanishad is important for the relative position which it assigns to the teaching of the Vedas, and the doctrine of the Upanishads. "Two sciences," it says, the knowers of Brahman tell us, "must be known, the higher and the inferior. The inferior is (the knowledge of) the R'gveda, the Yajurveda, the Sāmaveda, and the Atharvaveda, the knowledge of pronunciation, the ritual, grammar, explanation of Vedic texts, prosody, and astronomy. But the higher knowledge is that by which that imperishable Brahman is comprehended. That which is invisible, unseizable, without descent (or origin), without either color, eye, or ear, without hand or foot, eternal, manifold (in creation), all-pervading, very subtil, undecaying—the wise behold it as the cause of created beings." And in another place, the performers of the sacrificial rites ordained by the Veda are said to attain, indeed, to Indra's heaven in virtue of their pious work; but this state of bliss is declared to be unstable and perishable, and these "fools . . . drop (from their heaven) as soon as this heaven (the reward of their acts) has faded away. Fancying that pious acts, ordained by the Vedas and codes of law, are the highest (object of man), these ignorant people do not know that there is something else which leads to eternal bliss. Having enjoyed (the reward of their deeds) on the happy summit of paradise, they enter again this world, or one that is (even) lower. Those, on the contrary, who practice penance and faith, and, with subdued desire, live in the forest, under the vow of a religious mendicant, they, free from sin, enter through the sun to that abode where resides that immortal spirit, that spirit, indeed, of undecaying nature."

The "Taittvakāra," or "Kena," Upanishad, which, being one of the shortest, is in form one of the most philosophical treatises of this kind, puts in clearer language, perhaps, than any other Upanishad, the doctrine that the true knowledge of the supreme spirit consists in the consciousness which man acquires of his *incapacity* to understand it, since the human mind being capable only to comprehend finite objects, cannot have a knowledge of what is infinite.

The Upanishads are not supposed to have been revealed in the same manner as the Vedic hymns. See VEDA. Nevertheless, with the exception of a few confessedly modern Upanishads, they are not assigned to human authorship, but looked upon as inspired writings, to which the term *Śruti* (q. v.) applies. In several Upanishads, no special mention is made of their divine origin; in some, however, this is done. Thus the "Chhândogya" Upanishad, in its concluding section, relates: "This (knowledge of the soul) Brahman (the god of the Trimūrti) imparted to Prajāpati (a lord of creation—the patriarch Kasyapa, as Sāṅkhya explains); Prajāpati imparted it to Manu, and Manu to mankind;" the "Br'hadāraṇyaka" Upanishad,

which on three occasions gives long lists of teachers who handed it down to their pupils, always ascribes itself, in the last instance, to the authorship of "the self-existent Brahman (the supreme spirit);" and in a similar manner the "Mud'aka" Upanishad says that it was Brahman (the god of the Trimūrti), the creator of the universe, who first taught the science of the supreme spirit to his eldest son, Atharvan. As in the case of most ancient works of Sanscrit literature, the date of the Upanishads also still remains quite uncertain, and, wherever given, is purely conjectural. According to the native system, they are classified as belonging to one or the other of the four Vedas, with which they are held to stand in immediate connection. There are Upanishads, consequently, of the Itig-, Yajur-, Sāma-, and Atharvaveda. But this classification has no reference whatever to chronology. For a fuller account of these works, see Professor Weber's "Indische Studien," vols. I. II. (Berlin, 1850—1853), and his "Akademische Vorlesungen über Indische Literaturgeschichte" (Berlin, 1853); Professor M. Müller's "History of Ancient Sanskrit Literature" (Lond. 1860); John Muir's "Original Sanskrit Texts," vol. I.—IV. (Lond. 1853—1863); and the edition and translation of several of these Upanishads by E. Roer, "Rājendra Lāla Mitra," and E. B. Cowell, in the "Bibliotheca Indica;" also Raja Rammohun Roy's "Translation of several Principal Books, Passages, and Texts of the Veda" (Lond. 1832). The names of 149 Upanishads, as compiled from various sources by Professor M. Müller, may be found in the "Zeitschrift der Deutschen Morgenländischen Gesellschaft," vol. xix. p. 137, ff.

UPAPURAN'A. See PURAN'A.

UP'AS (the Malay word for *poison*) is the name given to a number of vegetable poisons in the Eastern Archipelago and the Philippine Islands. The most celebrated poison of this kind is produced by the *Antjar* (*Antiaris toxicaria*), a tree which grows in the Sunda and Philippine Islands. It attains a height of upwards of 100 feet, and belongs to the natural order ARTOCARPACEÆ (q. v.), the same order with the bread-fruit. The leaves are lanceolate. The female flowers are solitary; the male flowers congregated beneath them in numbers upon the receptacle, which has a long stalk, and is of the shape of a watch-glass. The fruit is a kind of drupe, covered with fleshy scales. From the milky juice of this tree (called in some of the islands *Pohon Upas*, *Antjar* in Java, and *Ipo* in the Philippines), mixed with black pepper, and the juice of galanga root and of ginger, the Malays prepare a poison for their arrows, which proves speedily fatal to men and to the larger mammalia. The only hope of relief is by means of severe vomitings and the excitement of profuse perspiration. Although the fresh juice of this tree, brought into contact with the skin, acts as a poison, the story of a poison-vale in Java, in which the exhalations of numerous poison-trees extinguish all animal life, and even all other vegetable life, is a mere fable. There is a narrow valley in Java where neither animal or vegetable life can subsist; but this is owing to carbonic acid gas emitted from the ground, as in the *Grotto del Cane*, near Naples, and the upas-tree is as incapable of living there as any other. It is found in forests, and does no harm to the other trees around it. The prepared upas or antjar poison is kept in closed tubes of bamboo, and is of the consistence of molasses. The flesh of animals killed by this poison may be eaten with perfect safety; although the virulence of the poison is shown by its extremely rapid action. It is not perfectly known what the substance is which gives to the juice of the upas tree its poisonous properties, but it appears to be an alkaloid. The fibre of the bark of the upas tree is sometimes made into cloth, but unless the fibre is thoroughly cleaned, garments made of it produce a painful itching.—A still more powerful poison than the upas antjar, employed in the same part of the world, is the *Upas Tjellak*, or *Upas Tieleu*, which is prepared in a similar manner from the root of the *Strychnos tieleu* (see STRYCHNOS). It abounds in strychnine.

UPHEAVAL or Upthrow of Strata, the change in stratified rocks from their original horizontal position to one more or less inclined, produced by an expansive subterranean force, or other power, like the pushing forward of the crust itself, as in the case of the Appalachian Mountains (q. v.). In slight changes of level, the continuity of the rock is unbroken; but frequently, immense cracks are formed, into which igneous rocks penetrate, and form a back-bone for the upraised mass, or dykes penetrating the strata. Upheavals may take place slowly, like the present

gradual change in the Scandinavian coast, or may be more rapid when produced by some sudden earthquake.

UPHOLSTERY, that branch of trade which relates to the furnishing of a house with curtains and other kinds of hangings. It is also applied more generally, and is made to include bedding, carpeting, and the covering of chairs, couches, &c.

UPOLU, one of the richest and most beautiful of the islands of the Pacific, belongs to the Samoan group, lying about 60 miles west of Tutula. It is 140 miles in circumference, and has 16,000 inhabitants. The island has been a mission-station for many years, and the English consul was till 1875 the son of Mr John Williams, the missionary, whose melancholy fate is well known. Many of the inhabitants are Christians. The chief harbor is Apia, a civilised-looking place, with many edifices on the European model. Many of the natives are turning their attention to the cultivation of cotton, and the cotton-seed grows wherever it is cast on the ground; the only trouble experienced in raising cotton is the clearing and keeping down the weeds. On an average, about 200 acres annually are under this crop. Coffee is also cultivated. The principal article of export, however, is cocoa-nut oil. U. affords a plentiful supply of fruits and vegetables, and is visited annually by numerous English and American whalers.

UPSA'LA, an ancient and beautiful town of Sweden, on the Fyris, a navigable stream, 45 miles north-north-west of Stockholm. The eastern part of the town stands on a wide and fertile plain; the west part, containing the chief buildings, occupies a high range of ground looking over an apparently boundless plain to the north and east. U. is the seat of an archbishop, who is the primate of the whole country. The great attraction is the cathedral, once a beautiful structure, and handsome still, though disfigured by restorations. It is in the Gothic style, built of brick, was founded in 1258 and completed 1435; is 330 feet long by 140 broad, and 103 feet high; and contains the tombs of Linnæus, and of Gustavus Vasa and several other Swedish kings. The university of U.—the chief institution of the kind in the country—founded in 1477, is attended by about 1400 students, taught by 30 professors, and 70 other teachers. The library contains 160,000 vols. and 6000 MSS., several of which are very valuable. Pop. (1875) 12,644, the mass of whom are dependent upon the university for their livelihood.—Two miles north of the town is Old Upsala, now a village, which, during the heathen period, was the seat of the Odin worship, with a splendid temple and sacred grove, which have now disappeared. Also, about four miles from U. are the famous Mora-stones, where in the middle ages the election and crowning of the Swedish kings took place.

U'RACHUS, The, in the adult human subject, is a small fibrous cord formed by the obliteration of a tubular canal, which in the embryo runs from the apex of the bladder to the umbilical cord. In other mammals, it remains open, and is continuous with one of the fetal membranes; and it has been found previous in the human subject at birth.

U'RAL, a river of Russia, called *Rimna* by the ancients, later, *Jaik*, and since 1778, by its present name, rises in the southern section of the Ural Mountains, near the east frontier of the government of Orenburg. It flows south through the district of Troitzk, past the town of Virchui-Uralsk, to its confluence with the Kizil; and in this region its course is over hilly meadows, and its current is very rapid, owing to its narrow and uneven bed. At the town of Orenk, the river bends westward, and runs in that direction as far as the mouth of the river Tchagan, after which it flows directly south, and falls into the Caspian Sea. It is deep enough for navigation; but owing to the scarcity of wood for ship-building, and the number of sandbanks that bar the river, no navigation can be carried on. This loss, however, is compensated by the fisheries of the river, which abounds in the most highly esteemed varieties of fish, and yields to the Cossacks settled along its banks an annual revenue of 600,000 rubles (£93,750). The U. has long served as the frontier separating Russia from the Kirghis Steppes, and many forts have been erected, and a settlement of Cossacks—known as the Ural Cossacks—established along the river. The direct length of the U. is estimated at 550 miles; with windings, 1040 miles. The principal affluents are the Kizil and Sakmara on the right, and the Or and Ilek on the left.

URAL MOUNTAINS (probably the Tartar word *ural*, belt), the *Hyperborean Mountains*, or *Rhipæi Montes*, of the ancients, form part of the boundary between Europe and Asia, and separate European Russia on the west from Siberia on the east. The chain extends south from the Kara sea, an arm of the Arctic Ocean, to the middle course of the Ural river, or from lat. 70° to that of 50° n., and is 1333 miles in length, with a breadth varying from 16 to 66 miles. Although the U. M. form really a single uninterrupted chain, geographers have agreed to consider them as divided into three sections—the Northern, Middle, and Southern Ural. The Northern Ural separates the basins of the rivers Petchora and Ob, is for the most part rocky, does not rise higher than 8000 feet, and is commonly called *Ponastof* (empty), because it is extremely poor in ore. The middle Ural, commonly called *Roudnoi* (metalliferous), the principal seat of the mineral riches of the whole chain, comprises the highest peaks, as the Kanjakovski Kamen, rising to 5000 feet; but in some places, the height is so insignificant, and the slope so gentle, that travellers can scarcely distinguish it from the lowlands. The Southern Ural divides itself into three branches, two of which extend to the east of the Ural river, and gradually disappear in the Uralo-Caspian deserts, while the third branch extends along the right—the western—bank of the Ural. The chain is composed chiefly of crystalline and metamorphic rocks, granite, gneiss, porphyry, chloritic, and micaceous schists. The U. M., especially the middle and the north part of the Southern Ural (the governments of Perm and Orenburg), abound in mines of gold, platinum, copper, and iron. These mines, or *zavods*, are partly the property of the state, partly that of private individuals. Of the latter, the chief are the Nijul-Tagilak, belonging to the Demidoff family, the Verchisetsk and Noviansk, belonging to the Takosoff family. The gold diggings occur on both slopes of the mountains, and gold is sometimes found in nuggets of considerable weight—the heaviest ever found in the chain being about 80 English lbs. in weight. In 1862, the amount of gold extracted from the U. M. was 185 poods 87 lbs. (6680 English lbs.). The platinum found is chiefly obtained from the Nijul-Tagilak mines, and the amount obtained was 148 poods (5323 English lbs.). The richest copper ores in the U. M. are malachite and azurite; but the metal is extracted also from pyrites. The total amount found in 1863 was 243,805 poods (8,959,140 English lbs.). The amount of iron extracted in 1862 was 4,365,348 cwts, of which 2,778,400 cwts. were made into steel. In 1874 the smelting establishments of the U. M. produced 13,200,000 poods of bronze, 69,000 poods of steel, and 100,000 poods of copper. Among precious stones, the most notable are the emerald, found on the eastern slope in the district of Ekaterinburg, and some of which weigh thirteen dwts. nine grains. Other precious stones are found, as the beryl, topaz, amethyst, and diamond, the last discovered in accordance with the prediction of Humboldt, but of small value. Malachite and jasper also occur. The pop. inhabiting the U. M. and supported by the mines, is 185,000 inhabitants.

URALSK, a Russian town, belonging to the territory of the Ural Cossacks, and included within the governorship of Orenburg, stands on the right bank of the Ural, 150 miles south-east of Samara. It was founded in 1693 by the Ural Cossacks, and was till 1775 known under the name of Jaitak. A good trade is carried on—the principal articles being fish, linglass, caviare, tallow, and cattle. There are three great yearly fairs—in July, October, and January. Pop. (1867) 6166.

URANIA (i. e., "the Heavenly Muse") was a daughter of Zeus and Mnemosyne. She was regarded as the Muse of Astronomy, and was represented with a celestial globe, to which she points with a little staff.

URANIUM (sym. U, equiv. 60—new system, 120—sp. gr. 18.4) is a very hard but moderately malleable metal, resembling nickel or iron in its lustre and color; but in a finely comminuted state, occurring as a black powder. It is not oxidised by exposure to air or water at ordinary temperatures; but if heated in the air, it burns brilliantly, and is converted into oxide. It is a comparatively rare metal, which never occurs native; its sources being *Pitch-blende*, which contains nearly 80 per cent. of black oxide; *Uranite*, which contains a hydrated double phosphate of lime and uranium; and *Chalcocite*, which is a similar phosphate of copper and uranium. U. forms at least four oxides, viz., two principal ones—a *protoxide*, UO , and a *sesquioxide*, U_2O_3 ; and two intermediate oxides—the *black oxide*, $2\text{UO} \cdot \text{U}_2\text{O}_3$, and the *green oxide*, $\text{UO} \cdot \text{U}_2\text{O}_3$. For the methods of preparing these oxides, the reader may consult any

of the larger chemical text-books. The black oxide is of much value as a pigment for coloring porcelain; and compounds of the sesquioxide (or peroxide) with the earths are employed to communicate a peculiar yellow tint to glass. The salts of the protoxide have a green, and those of the peroxide a yellow color. None of them are of any special importance. The metal is extracted from pitchblende; and its isolation in a pure form is due to Peligot in 1841; Klaproth's supposed metal (which he discovered in 1789) turning out to be the protoxide. The metal was not obtained in the compact form till 1856.

URBAN, the name of eight popes, of whom the following deserve to be specially noticed.—URBAN II., a Frenchman by birth, and originally a monk of Clugny, was elected in a council held at Terracina, in the year 1088, during the schismatical pontificate of the anti-pope Gilbert, styled Clement III. U.'s name was Otho, and he had been Bishop of Ostia. Soon after his election, he resumed possession of Rome, the fortresses of which had been occupied by the anti-pope, whom he compelled to withdraw. Gilbert, nevertheless, was still supported by his patron, Henry IV. of Germany, who had long been at feud with the papal see; and U., in concert with the celebrated Countess Matilda, having formed a strong party in Italy, Henry once more led an army thither, and excited in Rome against the pope a party, whom he induced to recall Gilbert—U. establishing himself at Anagni. The revolt of Conrad, the eldest son of Henry, against his father, and his coronation as emperor at Milan in 1098, and still more the successful appeal of Henry's queen, Adelaide, turned the tide of affairs in Italy. A great council was held at Piacenza in 1099, in which the anti-pope and his adherents were excommunicated. In the same council, the Crusade was proclaimed; and in the following autumn, U., in a council held at Clermont, made the well-known appeal on the same subject, which called forth that enthusiasm which was destined to lead to the long series of efforts for the recovery of the Holy Land, which forms so striking a characteristic of medieval history. In his later pontificate U. pursued the same course, and in the end, succeeded in driving Henry IV. out of Italy. The most important event of the last years of his pontificate was the holding of a council at Bari in 1098, in which many Greek Bishops were present, and in which the addition of the words *filioque* to the Creed was discussed. Thence he returned to Rome, of which he obtained full and undisturbed possession; and he died in the close of 1099, just at the time when the first Crusade which he had organised terminated in the successful occupation of Jerusalem.—URBAN V. (originally Willaume de Grimoard) is remarkable as practically the last of the popes who resided at Avignon, and the one by whom the papal seat was for a time re-transferred to Rome. He was a native of France, and had been Abbot of St Victor at Marseille. On the death of Innocent VI. in 1362, he was elected at Avignon, where he continued to reside, sending his legate, Cardinal Gil de Albornoz, to reduce the rebellious subjects of the papal see in Rome. After various alternations of peace and contest, U. took the resolve of returning in person to the ancient seat of the papacy. He set out in 1367; and landing at Corneto, proceeded first to Viterbo, and in the end to Rome, which he reached in October 1367. He found the papal city in a condition all but ruinous, and the whole of Italy overrun by bands of mercenaries, and a prey to intestine divisions of the worst character. He endeavored, in concert with the queen of Naples, Joanna, in the following year, and of the Emperor Charles IV., to repress these disorders, but with little success; and in 1370, he resolved once again to repeat the experiment of a withdrawal of the papal residence from Rome. He set out in September of that year; but only outlived his return to Avignon by a few weeks, and died in December 1370, leaving the reputation of great personal piety, disinterestedness, and zeal for the interests of religion and morality.—URBAN VI. deserves a special notice, as being the pope under whom the great Western Schism had its origin. His name was Bartolomeo Prignano, and at the time of his election he was Archbishop of Bari. On the death of Gregory XI. (1378), who had finally returned from Avignon to Rome, and died in that city, Prignano was elected in a conclave held at Rome under circumstances of great excitement, owing to the apprehension, on the part of the populace, of an intention to elect a French pope, and again abandon Rome. The cardinals in the conclave numbered 16, of whom 12 were French, and 4 Italians. Prignano, although not a cardinal, was elected April 8, 1378; and after the election had been made, the populace having broken into the hall, the cardinals dispersed; on the following day,

Urbi
Urea

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however, they returned, confirmed the election, Prignano assuming the title of Urban VI., under which name he was crowned, April 18, in the presence of the 16 cardinals. In July of the same year, the 12 French cardinals assembled at Anagni, and revoked the election of U., in which they declared that they had been acting under the fear of violence. To this course they are proceeding in the reforms of discipline, and especially of the simony and the irregular life of the clergy, including the cardinals themselves. They were joined by three of the Italian cardinals (one of them having died). On the 20th September, they proceeded to elect the cardinal bishop of Cambray (born Count of Geneva) pope, under the name of Clement VII. Clement took up his residence at Avignon. U., on the contrary, remained at Rome, where he appointed 26 new cardinals, and excommunicated Clement and his adherents. This conflict of claims was the origin of the WESTERN SCHISM (q. v.). U. was recognised as the lawful pope by one portion of the West, Clement by the other, and each maintained his claim by measures of the most extreme character. U. especially, although his title seems to have been best founded, weakened his cause by his excessive violence. Having engaged in a dispute with Charles, king of Naples, whom he had himself crowned, he was besieged by that prince at Novara, whence he withdrew to Genoa, taking with him, as prisoners, the cardinals of his party with whom he had quarrelled, and several of whom he is said to have put to death. In 1389, while he was on his way to Ferentino, he fell from his horse, and having been conveyed to Rome, died from the injuries thus sustained in October of that year.—**URBAN VIII.** was the successor of Gregory XV. His family name was Maffeo Barberini. He was born at Florence in 1568; and after a long series of brilliant services, both in the domestic administration and in foreign nunciatures, he was elected pope in September 1623. In the difficult position of Roman affairs, as complicated between France, Austria, and Spain, in the war of the Valtellina, to which he succeeded on his first election, he acquitted himself with much dexterity. His pontificate was also signalised by the acquisition to the Holy See of the duchy of Urbino (q. v.) in 1626. U. died in 1644. His memory has suffered through the imputation of nepotism; but his administration was, on the whole, vigorous and enlightened. He was the founder of the celebrated college of the Propaganda, and to him Rome is indebted for many public works, including large and important additions to the Vatican Library. Some of the early stages of the Jansenist controversy (q. v.) fall within this pontificate.

URBI ET O'RBI (Lat. to the city and the world), a form used in the publication of papal bulls, for the purpose of signifying their formal promulgation to the entire Catholic world, as well as to the city of Rome. By the canon law, one of the conditions required in order that any new law shall be held to have force is "promulgation," but a very celebrated controversy arose in the 17th c. as to the kind of promulgation which should be regarded as sufficient. In ancient times, the practice of the popes had been to send copies of their bulls to the primates, metropolitans, and other ecclesiastical heads of the several churches, to be by them communicated to their suffragan bishops; but in progress of time, the practice of publicly proclaiming or of posting up the decree in the Campo dei Fiori in Rome was substituted for this transmission; and decrees addressed **URBI ET O'RBI**, and published in this way, were held to be thus sufficiently promulgated to the various churches, and to be thenceforth of full force. The French jurists of the 17th c. strenuously controverted this view. The controversy is of little importance, even in the Roman Church, in these days of universal publicity and of rapid and simultaneous diffusion of intelligence.

URBINO, in Central Italy, capital of the province of Urbino and Pesaro, situated 30 miles south-west of Pesaro, and between the rivers Metauro and Foglia. Its walls date from the 15th c. It has a magnificent palace, once the residence of the Dukes of the famous library of the Della Rovere family, afterwards of the Papal. Another handsome palace is that of the Albini, belonging to the family of the Albini, who became rich and powerful, and gave a pope to the church, Clement XI. U. is an archiepiscopal see. Its manufactures are chiefly of silk. It is the birth place of Raphael. Pop. 8000.

U. was a *municipium* under the Romans, and during the middle ages became the seat of a race of independent dukes, who existed up to 1696, when, on the death of Francesco, the last duke, Urban VIII. took possession of the duchy as a vacant fief; and it continued to form part of the papal states till 1863, when it became part of the kingdom of Italy.

URCHIN, Sea. See ECHINIDÆ.

URE, Andrew, M.D., a distinguished chemist, was born at Glasgow in 1778, educated at Glasgow University, subsequently prosecuted his medical studies at Edinburgh, and returned to Glasgow, where he received the degree of M.D. in 1801. In 1802, he became Professor of Chemistry and Natural Philosophy in the Andersonian Institution (q. v.), took an active part in the establishment (1809) of an observatory at Glasgow, and was appointed its first astronomer. In 1818, he made his appearance in the literary world as the author of a "Systematic Table of the Materia Medica," which was followed in 1818 by "New Experimental Researches on some of the leading Doctrines of Caloric," a memoir which, read before the Royal Society, and printed in the "Philosophical Transactions," brought U. prominently into notice as a natural philosopher. Several papers on chemical subjects, the fruits of his accurate and extensive researches, followed. In 1821, appeared his "Dictionary of Chemistry;" in 1823, a paper "On the Ultimate Analysis of Animal and Vegetable Substances," one of the earliest contributions to organic analysis, and a translation of Berthollet on "Dyeing;" and in 1823, a "System of Geology," in which the hypothesis of a general Flood was maintained. In 1830, U. removed to London, and in 1834 was appointed analytical chemist to the Board of Customs. The products of his pen from this time assume more of a technological character, as the "Philosophy of Manufactures" (1835), "The Cotton Manufacture of Great Britain compared with that of other Countries" (1836), and "Dictionary of Arts, Manufactures, and Mines" (1839). A second edition of this work was last published in 1853, and a revised and enlarged one in America in 1860. U. was chosen a Fellow of the Royal Society in 1832, as well as of the Geological, Astronomical, and other societies at home and abroad. He died in London, 2d January 1857.

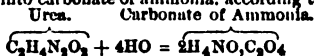
UREA ($C_2H_4N_2O_2$) is an organic matter which derives its name from its having been originally discovered in the urine, of which it forms the most important and characteristic ingredient. It was until recently regarded as an organic base or alkaloid; but during the last few years it has been placed amongst the *amides*, a group of neutral, and for the most part crystallisable compounds, of the *ammonia type* (see TYPES, CHEMICAL), in which one of the three equivalents of hydrogen is replaced by the radical of an organic acid. For example, if R represent the radical,

$\begin{matrix} R \\ | \\ H \\ | \\ H \end{matrix} N$ represents the corresponding amide; and the character of the type is not affected by doubling the entire number of molecules, or changing it into $\begin{matrix} R_2 \\ | \\ H_2 \\ | \\ H_2 \end{matrix} N_2$.

Now, if in this formula we substitute C_2O_2 (carbonic oxide or carbonyl), as it is now

often termed) for R_2 , we obtain $\begin{matrix} C_2O_2 \\ | \\ H_2 \end{matrix} N_2$, which is identical with $C_2H_4N_2O_2$, and

possesses the advantage of shewing the probable grouping of the elements in urea. Pure urea, which has been allowed to crystallise slowly, occurs in white, glistening, streaked, four-sided prisms; but when the crystallisation is rapid or disturbed, it separates in small white silky needles. It is devoid of smell, has a coolish, bitter taste, like that of saltpetre (which it closely resembles in its external form), and is very slightly deliquescent. It is readily soluble in water and alcohol, but only slightly in ether. When heated to about 248° , it fuses, evolves ammonia, and becomes completely decomposed. A solution of pure urea in distilled water may be kept for a long time, and may even be boiled without undergoing decomposition; but is heated in a closed tube to about 364° , each equivalent combines with four of water, and is converted into carbonate of ammonia, according to the formula



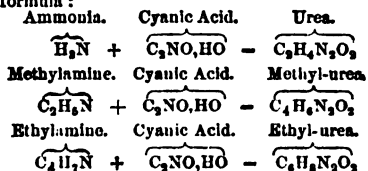
A similar change takes place slowly at ordinary temperatures in the urea contained in the urine, the mucus of the bladder acting as a ferment, and thus rendering urine ammoniacal after it has been kept for a few days.

The following are some of the most important of the compounds of urea. *Nitrate of urea* ($C_2H_4N_2O_2.NO_3.HO$) and *oxalate of urea* $\{2(C_2H_4N_2O_2).C_4O_6.8HO\}$ are readily crystallisable salts, formed by the direct addition of the respective acids to a moderately strong solution of urea. As nitrate of urea requires eight parts of cold water and is still more insoluble if an excess of free nitric acid is present, and the oxalate is more insoluble than the nitrate, while urea dissolves in its own weight of water, these salts may be employed to test for, and approximately determine the quantity of, urea. Amongst the compounds of urea with metallic oxides, those which it forms with the oxides of mercury are especially interesting, and have been completely examined by Liebig. A result of his researches in his celebrated method, which is now in universal use, of determining the amount of urea volumetrically.

Urea occurs as the main and characteristic ingredient of the urine of man and mammals, being most abundant in that of carnivorous, and least so in that of vegetable feeders. The average quantity excreted by the human subject is mentioned in the article URINE. It is also a constituent of the fluids of the eye, of the sweat, and (in minute quantity) of the blood, and of the liquor amnii (of the fœtus). There can be no doubt that it is a final product of the regressive metamorphosis of the living tissues, or of their disintegration into simpler compounds, by means of which the final elimination of the worn-out structures is facilitated. Thus, we find that urea may be obtained by oxidising agents from uric acid, creatine, allantoin, &c., in the laboratory, and there is every reason to suppose that similar changes may occur in the system. Whether, when an excess of food is taken, a portion of it may be formed in the blood into urea, and then at once separated without ever having entered into the structure of the higher tissues, is a point which is scarcely decided.

Until the discovery by Liebig and Wöhler of the artificial formation of urea, its only source was the urine, from which, after evaporation, the nitrate was separated, purified by animal charcoal, and the urea liberated by the addition of carbonate of baryta, and finally extracted by alcohol, from which it was allowed to crystallise. It is now known that there are many different ways of forming it, as (1) by the action of chlorocarbonic oxide or phosgene gas ($C_2Cl_2.CO$) on dry ammonia; or (2) by heating a mixture of carbonic ether ($2C_2H_6.C_2O_4$) and an alcoholic solution of ammonia to about 356° in a closed tube (both of which methods shew that urea is truly the *amide of carbonic acid*); but the best practical method is essentially the original one of mixing watery solutions of cyanide of potash and sulphate of ammonia, and evaporating the solution, which leaves a residue consisting of urea and sulphate of potash, the former of which may be extracted by alcohol.

UREAS, The Compound, include a large class of singular organic bodies, for the knowledge of which chemistry is mainly indebted to Professor Hofmann. Compounds of this kind are most readily formed by the action of cyanic acid on the amide or amidogen bases of the alcoholic radicals, such as methylamine, ethylamine, &c. (the methyls, &c., of Miller and other chemists), instead of on ammonia. Thus, while ordinary urea is formed by the action of this acid in ammonia, methyl-urea, ethyl-urea, &c., are formed by its action on methylamine, ethylamine, &c., as shewn in the following formula:



These are the simplest forms of these compounds; amongst the more complicated ones are ethyl-methyl-urea, $C_6H_{11}N_2O_2$, phenyl-ethyl-urea, $C_{10}H_{15}N_2O_2$, &c. All

these compound ureas combine like ordinary urea with acids, and form crystallisable salts.

URE'DO, a genus of minute parasitic fungi, of the order *Coniomycetes*. The original genus *U.* has been divided into many genera, forming a group called *Uredineæ*, which contains a multitude of species, parasitic on phanerogamous plants of almost every natural order, and in all parts of the world, at the equator and at the extreme limits of arctic and antarctic vegetation. Different plants have their own peculiar parasites of this kind, or the same *Uredineæ* are at least confined to plants nearly allied. A few species occur on ferns, but not very frequently. Every external part of plants, except the roots, is liable to be infested with these fungi, and some of them attack the inner tissues, their spores at length breaking through the outer strata of cells. Submerged parts of plants are never affected by them, for fungi dislike water; but the floating portions of aquatic plants are not exempt; and in all cases a moist atmosphere seems to be favorable to their development. Rank luxuriance of growth is often attended by their appearance. A plant once attacked is afterwards subject, if perennial, to the same parasite, even if removed to another situation. There is reason to believe, from experiments made by Fée, that the spores of the *Uredineæ* are taken up by the roots of plants from the soil, and find their way with the sap to the place proper for their growth. See **BRAND, BUNT, MILDEW, RUST and SMUT**.

URE'NA, a genus of herbaceous plants of the natural order *Malvaceæ*. The bark is very fibrous; and the fibre of *U. lobata* and *U. sinuata*, weeds common in most parts of India, is used as a substitute for flax. It is strong, and tolerably fine.

UR'ETERS (Gr. *ouron* urine, and *tereîn*, to keep), the canals by which the urine is conveyed from the pelvis of the kidney (see **KIDNEYS**) on either side to the base of the bladder. Each ureter is about eighteen inches in length, and enters the bladder in so slanting a direction as to prevent regurgitation.

When a concretion is formed in the kidney, the ordinary and most favorable event is that it should descend through the ureter to the bladder. The passage of a stone through this tube gives rise to a series of violent symptoms, which are thus summed up by Dr. Witt: "The patient complains of sudden and most severe pain, first in the loins and groin, subsequently in the testes (in the male) under the thigh. The testes are also retracted spasmodically. At the same time, there are violent sickness, faintness, and collapse, which may last two or three days, and are only relieved when the stone reaches the bladder."—"The Surgeon's Vade-mecum," 8th ed. p. 594. The treatment consists in the warm bath, and the inhalation of chloroform, or opium in large doses (both of which serve to allay spasm and deaden pain), the free use of diluents to wash down the concretion, and if the sickness is very severe, an occasional tumbler of hot water containing half a tea-spoonful of carbonate of soda.

URE'THRA is the term given in Anatomy to the canal by which the urine is discharged from the bladder. Its most common affections are the special inflammatory condition of its mucous lining, known as Gonorrhœa (q. v.), and Stricture (q. v.).

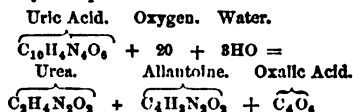
UR'FA, or Orfa, the modern name of **EDessa** (q. v.).

UR'GA, a town of Mongolia, on the river Tola, stands in a valley, at the height of 4100 feet above sea-level, 360 miles south-east of Irkutsk. In one of the suburbs of the town is a college of Mongolian priests, which is the seat of the Lama of the Mongols. See **LAMAISM**. The college or convent covers an extensive area, and includes the dwellings of the priests. The population is made up of a colony of Chinese and about 25,000 Mongols, 10,000 of whom are priests. Each family educates one of its children to be a priest. The buildings of the college have of themselves more the appearance of a town than the other quarters of Urga. The number of the inhabitants is not stated.

UR'I, one of the *Waldstätten* or Forest Cantons of Switzerland, forms part of the Hill Country (see **SWITZERLAND**) which surrounds the Lake of Lucerne, and is bounded on the west by the cantons of Unterwalden, Bern, and Valais. It has an area of 414 sq. m., and its pop. in 1870 was 16,107; in 1876, 16,900. It consists of one valley, that of the Reuss, about 80 miles in length, and enclosed on all sides by lofty

mountain chains, which also include the south-eastern bay or reach of the lake into which the river falls. A great high-road passes through the valley, and terminates on the south at the St Gotthard Pass, which connects the Uri with Ticino, and forms part of one of the great routes into Italy. Uri is almost entirely pastoral, and its products are those of its herds and flocks. Goats are very numerous. In the low grounds, there are a few fields of corn and potatoes, and gardens and orchards, but even this cultivation is limited. The population speak a Swiss-German dialect, and are Roman Catholic. Uri is a democracy. The landsgemeinde, held in a meadow once a year, is formed of the whole male population who have reached 20 years of age. The highest power resides in this assembly. The pre-consideration and superintendence of the law belongs to the *landrath*, which consists of 7 members chosen by the landsgemeinde, and 61 by the several communes. A governing council of 11 members, with the landamman as president, discharges executive functions. Civil justice is administered in the highest instance by a cautional court of 11 members. A tribunal of 7 members decides in criminal cases. Altorf, the capital, is a small town, with (1870) 2724 inhabitants. A fountain surrounded by stone statues of Tell (q. v.) and his son marks, according to tradition, the spot where the former took his aim, and another that where the boy stood with the apple on his head.

URIC or Lithic Acid ($C_{10}H_4N_4O_6$) derives its names from its being a constituent of urine and of urinary calculi respectively. In a state of purity, it occurs in the form of a loose white powder or scales consisting of minute crystals, devoid of smell or taste, only very slightly soluble in water (1 part requiring about 15,000 parts of cold, and 1800 of boiling water), and quite insoluble in alcohol and ether. This acid is, however, soluble without decomposition in strong sulphuric acid, and it may be thrown down from this solution by the addition of water. It is also soluble in the carbonates, borates, phosphates, lactates, and acetates of the alkalis, extracting from these salts a part of their base, with which it forms acid urates. Litmus paper is reddened by its moist crystals, or by a hot watery solution. This acid is not volatile, and by dry distillation is decomposed into carbonate of ammonia, urea, cyanuric acid, hydrocyanic acid, &c. On heating a mixture of uric acid and water, with gradual additions of peroxide of lead, which is a strong oxidising agent, the uric acid becomes oxidised, takes up water, and becomes converted into urea, allantoin, and oxalic acid, as is shown by the equation:



the lead being left in combination with the oxalic acid. This is a most important result in its physiological bearing, since it shews how uric acid is a probable stage towards the formation of urea, and as explaining a probable source of the oxalic acid, which is often present in the urine in cases of deficient respiration and aëration; and this view is confirmed by the experiment of introducing uric acid into the stomach or veins of an animal, when the presence of oxalate of lime, and the augmentation of urea) are very soon perceived in the urine.

Uric acid is a very weak bibasic acid, forming with bases two series of salts, the neutral and the acid, of which the former are the more soluble. Amongst the most important of these urates are—(1.) *Neutral Urate of Potash*, which occurs in the form of a white granular crystalline powder, difficult of solution in water (requiring 44 parts of cold, and 35 of boiling water), but readily soluble in an excess of potash, from which solution carbonic acid throws down the *Acid Urate of Potash* in the form of a transparent jelly, which sometimes falls in the form of a powder; (2.) *Two Urates of Soda*, each of which is less soluble than the corresponding potash salt; (3.) *Acid Urate of Ammonia*; (4.) *Acid Urate of Magnesia*; (5.) *Two Urates of Lime*; and (6.) *Urate of Lithia*, which is more soluble than any other urate; and hence lithia water is an important therapeutic agent in converting uric acid and the more insoluble urates into a soluble salt in the living body.

Uric acid is widely distributed throughout the animal organism. It occurs no,

only in the urine of man and carnivorous animals, but is the chief constituent (either free or in combination) of many calculi occurring in the kidneys or bladder, and of numerous urinary sediments. The urinary secretion of birds and reptiles consists almost entirely of urates, which are also found in the excrements of caterpillars, butterflies, beetles, &c., and of many molluscs. Moreover, in very minute quantities, it occurs as a urate in healthy blood, in which fluid it has been found in excess in gout and Bright's disease, and is a constituent of the aqueous extract of the spleen, liver, lungs, pancreas, and brain. The *chalk-stones* occurring about the smaller joints, and in the lobes of the ear of gouty patients, consist mainly of urate of soda.

The best and most ready mode of obtaining pure uric acid is from the semi-solid urine of serpents, which consists almost entirely of urates. The mass is boiled with potash, which expels any ammonia that is present, and a stream of carbonic acid is then passed through the strained potash solution, which throws down acid urate of potash. This precipitate is dissolved in water, and decomposed by hydrochloric acid, which throws down the uric acid in minute crystals. The form in which this acid crystallises is liable to great variations. Sometimes we have flat tablets resembling whetstones, or sections with a double knife through biconvex lenses; at other times, more or less perfect rhombic tablets, and sometimes hexagonal plates, barrel-shaped prisms, and toothed crystals. If there is any doubt as to the nature of the crystals, they should be dissolved (under the microscope) in a little potash solution, and a drop of hydrochloric acid then added, when sufficiently characteristic forms are sure to appear.

The marvelous researches of Wöhler and Liebig on the products of decomposition of uric acid by nitric acid, constitute an epoch in organic chemistry. The most important products, some of which are obtained directly, and others indirectly, are: (1.) *Allozan*, $C_8H_5N_3O_8$ (which under the influence of various reagents, yields *allozan acid*, *oxazalic acid*, *mykomelonic acid*, and *diateric acid*); (2.) *Parabanic acid*, $C_8H_5N_3O_8$ (which yields *oxaluric acid*); (3.) *Alloxantine*, $C_8H_5N_3O_{10}$ (which yields *allozan*, *allitric acid*, *uramel*, *thionuric acid*, *oxaluric acid*, and *murexide*); (4.) *Murexide*, $C_8H_5N_3O_{10}$ (which yields *murezan*, or *uramel*, and *allozan*); and (5.) *Urea*, which breaks up into carbonic acid and ammonia. Moreover, by boiling oxaluric acid with water it is decomposed into oxalic acid and urea. Of these substances, we shall only notice *murexide*, which has two special claims to notice. It is used as a pigment in dyeing, being probably the old *Tyrian Purple* (see EUREXIDE), and it affords a ready test for a mere trace of uric acid. In using it for the latter purpose, the substance supposed to contain uric acid is heated on a slip of glass with a drop of nitric acid, and carefully evaporated to dryness. If uric acid is present, the residue has a red color, which is converted by vapor of ammonia into a fine crimson, and the addition of a drop of a solution of potash develops a splendid purple tint, which disappears on the application of heat.

Uric acid must be regarded, like urea, as a product of the disintegration of the tissues; and it is far from improbable that all the urea which is secreted may have pre-existed in the form exercise of uric acid—a view which is supported by the fact, that whatever (like excessive or water-drinking) increases the amount of urea, decreases that of uric acid, and *vice versa*. See URAM.

URICONIUM, an ancient Roman city of Britain, the site of which is about four miles to the east of Shrewsbury, and is partly occupied by the village of Wroxeter. The original name seems to have been *Piroconium*, which was changed in the later Roman-British period to Uriconium. It is mentioned by Ptolemy as existing in the beginning of the second century A.D. The remains of the city shew it to have been a place of much importance. The wall can still be traced near the banks of the Severn, forming an irregular oval rather more than three miles in circumference. It appears that one of the principal streets of the city occupied the line of the *Watling Street Road*. The remains of U. have recently have been explored by an association formed for the purpose at Shrewsbury, and many curious relics of antiquity have been discovered, throwing great light on Roman civilisation in Britain. The human remains found in the excavations which have been made, affording proof of death by violence or by suffocation, shew that the city did not slowly decay, but was sacked and burned by enemies, which probably took place about the 5th century. Of this, however, there is no certain historic record. The ruins seem

to have remained with little change, except the gradual process of decay, till about the 12th c., when they were used as materials for other buildings. Some of the churches of the neighborhood were built of the old Roman bricks. The walls of buildings are now found, perfect as far as the previous accumulation of earth rendered it difficult to remove the bricks of which they were constructed. The most remarkable relic of antiquity in U. is the *Old Wall*, a great mass of Roman masonry, which appears to have been the side of a great edifice, remains of mosaic pavements having been found near it, and apparently connected with it. The edifice to which the Old Wall belonged is supposed to have occupied a corner at the junction of two principal streets. The excavations which have been made, however, leave it very difficult to explain the character and purpose of the remains discovered. Several inscriptions have been found at U., but none of great interest. A museum has been formed at Shrewsbury, in which most of the antiquities from this spot are collected. Hair-pins, combs, and rings are particularly numerous amongst them.

U'RIM AND THU'MMIM (Heb.), a mysterious contrivance in or on the High-Priest's breast-plate, either consisting of the four rows of precious stones upon which the names of the 12 tribes were engraved, or of two images personifying—most probably—"Truth" and "Revelation." Luther's translation, "Light and Truth," has no more real foundation than that of the LXX. and the Vulgate, which is "Utterance and Truth." To this translation, the fact of the picture of "Truth" (Aletheia)—in sapphires or other precious stones—being suspended from the Egyptian high-priest's breast, had probably given rise. The etymology of the two words, which, derived from Arabic roots, would indicate "Brilliant Amulet," "Perfect Light," &c., is in reality no more satisfactory than the account of the manner in which the contrivance was used for oracular purposes, or of the time when, in reality, it ceased to act. It is never mentioned after Solomon's time.

URINARY SEDIMENTS is a general term which includes all those substances which occur in a non-dissolved state in the urine. Most of these sediments are not formed until after the urine has been discharged and has cooled; some, however, are formed in the urinary organs, and under favoring conditions may give rise to urinary concretions. Hence it is a point of importance to ascertain whether a sediment occurring in a specimen of fresh urine has been formed before or after its discharge.

The chemical and microscopical characters of these sediments has a double bearing on the detection of disease: (1.) "From the investigation of these sediments," says Professor Vogel, "we can draw sure conclusions regarding special changes that are going on in the general nutrition of the body. They show us that an excessive quantity of certain substances (as, for example, uric, hippuric, or oxalic acid) is being discharged with the urine, and has therefore been produced in the body; and we thus often obtain at a glance information of great importance, which could otherwise only be procured by a tedious process; and (2.) they point out to us certain local diseases of the urinary system. Thus, from a sediment containing pus, we infer that suppuration is going on in some part of that system; and the presence of cylindrical casts or tubes in the sediment informs us of certain morbid changes in the structure of the kidneys; and if the ordinary symptoms reveal the presence of stone in the bladder, we can ascertain its probable nature from the character of the sediment or gravel."

The mode of formation of morbid sediments is well illustrated by a sketch of the changes which healthy urine undergoes after prolonged exposure to the air. In the course of two or three days, the acidity of the urine is found to have increased, and this condition of *acid fermentation* will frequently continue for some weeks, giving rise to the deposition of (1.) free uric acid; (2.) acid urates (chiefly urate of soda); and (3.) oxalate of lime. In a few weeks, or often much sooner, the uric becomes alkaline, or *alkaline fermentation* is established, in consequence of the urea being converted into carbonate of ammonia. The urine now becomes paler, while the red or yellow crystals of uric acid are replaced by white amorphous granules and colorless refracting prismatic crystals. In other words, the former precipitate is replaced by (1.) phosphate of ammonia and magnesia (commonly known as triple phosphate); (2.) phosphate of lime; and (3.) urate of ammonia. In certain forms of disease, these changes take place much more rapidly, and the second change—the alkaline fermenta-

tion—may occur without a pre-existing acid fermentation, and even within the bladder. In addition to the above-named substances, which arise from the decomposition of healthy urine, others occur in various morbid conditions of the system; and we may divide the urinary sediments generally into the two great groups of (1.) the unorganised and (2.) the organised deposits. The unorganised sediments include uric acid, the urates (chiefly urate of soda), hippuric acid, oxalate of lime, earthy phosphates (viz., phosphate of lime, and triple phosphate), cystine, xanthine, hypoxanthine (formerly known as guanine), and tyrosine; while the organised sediments include mucus and epithelial scales, blood corpuscles, pus corpuscles, cancerous and tubercular matter, fibrinous casts of the tubes of the kidney, spermatozoa, fungi, infusoria, &c. Of the unorganised sediments, uric acid, the urates (excepting urate of ammonia), hippuric acid, and cystine occur only in acid urine; and urate of ammonia, triple phosphate, and phosphate of lime, in alkaline or neutral urine. Oxalate of lime and the organised sediments occur both in acid and alkaline urine; but alkaline urine is the more natural *habitat* for fungi and infusoria. It is comparatively seldom that a sediment consists of a single ingredient. Most of our knowledge on this important subject is due to the labors of English physicians, amongst whom the names of Prout and Golding Bird are especially deserving of notice. For details regarding the mode of treatment suitable in the most important of the sediments, we may refer to the articles LITHIC ACID DIATHESIS, OXALURIA, and PHOSPHATIC DIATHESIS, in this work, and to Dr G. Bird's "Urinary Deposits and their Treatment;" while for details regarding their chemical and microscopical characters, Neubauer and Vogel, "On the Urine," translated under the auspices of the New Sydenham Society, may be consulted.

U' RINE is a fluid which is secreted or separated by the kidneys from the blood, and it is the principal means of removing the worn-out tissues, especially the nitrogenous and saline matters, from the system. It is a very complex fluid, and its composition varies considerably in different classes of animals, and mainly in accordance with the nature of the food.

Healthy human urine, when freshly discharged, is a clear fluid of a bright amber color, a bitter, saltish taste, and a peculiar aromatic odor. Its normal reaction is acid, and its specific gravity ranges from 1.015 to 1.025. From a table published in Day's "Physiological Chemistry," p. 362, it appears that an adult man of ordinary weight (about eleven stones) secretes in 24 hours about 52 fluid ounces (or rather more than two pints and a half) of urine, the range extending from 40 to 70 ounces; and that these 52 ounces yield, on evaporation, 364 grains of solid constituents, the remainder being water, which is expelled by heat. Of these 365 grains, 590 (or more than an ounce) are composed of Urea (q. v.), and 266 of chloride of sodium (or common salt); while the remaining 149 grains are made up of Uric Acid (q. v.), Hippuric Acid (q. v.), sulphuric acid, 32 grains; phosphoric acid, 54 grains; earthy phosphates, 15 grains; ammonia (in the form of hydrochlorate), 11 grains; with smaller quantities (in most cases mere traces) of Creatinine (q. v.) and Creatine (q. v.), xanthine, hypoxanthine, coloring matters, mucus (from the walls of the bladder), iron, silica, and fluorine. The fluid also holds an undetermined quantity of gases (carbonic acid and a little nitrogen) in solution. The most characteristic and important of these ingredients is the urea, the daily excretion of which is modified by various circumstances. On a purely animal diet, Lehmann found that he secreted two-fifths more urea than when he was living on an ordinary mixed diet; while on a mixed diet there was secreted almost one-third more than on a purely vegetable diet; while finally, on a non-nitrogenous diet, the amount of urea was less than half the quantity secreted during a mixed diet. The free use of common salt increases the daily excretion of urea, in consequence, doubtless, of its augmenting the rapidity of the destructive action always going on in all the tissues; while alcohol, tea, coffee, and tobacco (whether smoked or chewed) diminish the daily quantity. The only medicine which increases its quantity to any marked degree is *Liquor Potassae*. The daily quantity is increased in many diseases (typhoid fever and many other acute diseases, especially inflammation of the meninges of the brain), while in Bright's Disease and a few other disorders, it is diminished. The daily amount of excreted uric acid, like that of urea, varies with the nature of the food. Thus, for instance, Professor Haughton found that the mean daily quantity of uric acid excreted by meat-eaters and wine-drinkers was 4.5 grains, while vegeta-

riens yielded an average of only 1.48 grains, part of which, moreover, was hippuric acid. As an excess of uric acid is likely to give rise to gravel or stone, it should be generally known that the free ingestion of water diminishes its excretion, while at the same time it increases the amount of urea, into which the uric acid is probably transformed by oxidation. The daily amount is diminished by strong bodily exercise, and increased by repose; the reverse of what holds good in relation to the urea. The amount is increased when the digestive functions are disturbed, as after the use of indigestible food or excess of alcoholic drinks; in those conditions of the system which are associated with much disturbance of the functions of respiration and circulation; and in disorders accompanied with severe febrile symptoms, such as acute rheumatism. Its entire absence seems compatible with perfect health. With regard to *hippuric acid*, there has been much discussion, not only as to the quantity in which it occurs, but as to whether it actually exists in healthy urine. Thus, Weismann, a German chemist, finds that on a mixed diet he secreted more than 40 grains of this acid daily, and on a purely animal diet, only 12 grains. Duchek and Hölle deny that it is a constant ingredient of healthy human urine; and Professor Houghton only met with it once in the urine of ten men. Dr Benze Jones, a very trustworthy chemist, found that a man, A, weighing 152 lbs., and a man, B, weighing 202 lbs., living on a mixed diet, excreted daily, on an average, 4.9 and 6.5 grains of hippuric acid, the corresponding quantities of uric acid being 7.7 and 12.6 grains. In cases of jaundice, no traces of hippuric acid are present, even after the administration of benzoic acid,* which is usually converted in the system into hippuric acid. Hence it may be inferred that a healthy condition of the urine is essential to the formation of this acid in the system. Nothing is known with certainty regarding the diseases in which this acid is secreted to excess. The only other characteristic ingredient of the urine is its *coloring matter*. Professor Harley believes that he has isolated the normal uric-pigment, to which he applies the term *urochromatin*; and from its always containing iron, and on other grounds, he regards it as modified hæmatin or blood-pigment. Mr Schunck has also shewn that indigo-blue, in very small quantity, is almost always present.†

It has been already stated that fresh healthy human urine presents an acid reaction. This reaction mainly depends upon the presence of acid phosphates of the alkalies and earths, although the presence of free acids, such as free hippuric, or possibly lactic acid (which, however, is not a normal ingredient), may occasionally contribute to increase the acidity. To determine the acidity of the collective 24 hours' urine, we take a solution of oxalic acid of known strength, and ascertain the relative quantities of a solution (of definite strength) of caustic soda, which are required to perfectly neutralise equal volumes of the urine and of the oxalic acid solution. In this way it is found that the total quantity of free acid in the daily urine of a healthy man corresponds in neutralising power to about 84 grains of oxalic acid. The degree of acidity varies in different parts of the day. Dr Benze Jones first mooted the idea (in 1849), that the respective acidities of the secretions of the kidneys and stomach stood in an inverse relation to one another, and that the urine thus loses its acidity, and may even become alkaline during stomacal digestion. Dr Roberts of Manchester, who has subsequently investigated this point, finds that the effect of a meal on the acidity of the urine begins to shew itself in the second hour afterwards, is most marked during the next three hours, and disappears by the end of the sixth hour, the fluid being almost always positively alkaline during the third and fourth hours. Independently of this periodic alkalinity, the urine may be made alkaline at will by the administration of caustic alkalies, their carbonates or their

* Duchek found that when 1 gramme (15.44 grains) of benzoic acid was taken, 0.714 of a gramme of hippuric acid was excreted; when 2 grammes were taken, 1.857 grammes of hippuric acid, and 0.421 of benzoic acid, were excreted; and the ingestion of 4 grammes was followed by the excretion of 1.714 of hippuric acid and 2.500 of benzoic acid. Hence the limit of conversion had been already exceeded.

† He failed to detect it in only one case out of forty. He only succeeded in obtaining *one grain* by working for several weeks on the urine of two persons. The urine of the horse and cow yielded comparatively large quantities.

salts, with organic acids (citrates, tartrates, &c., such as occur in many fruits); whilst after the administration of acids the acidity is much increased.

In disease, the urine may either contain only its ordinary ingredients in abnormal proportions, or it may contain ingredients not occurring in the healthy fluid. Thus there may be an excess or diminution of urea, an excess of uric acid, a diminution of chloride of sodium, which, in cases of inflammation of the lungs, may fall from 366 grains to a mere trace, and, by its daily diminution or augmentation, tells with certainty whether the disease is gaining or losing ground; an excess of coloring matter or of mucus, &c.; or, on the other hand, the urine may contain albumen, sugar, oxalic acid (in combination with lime), fat, leucine and tyrosine, bile-pigment, biliary acid, &c. The subject of "the urine in disease" is, however, so wide a one that we must refer our readers for details to Lehmann's "Physiological Chemistry," 3 vols. (translated for the Cavendish Society), to Dr Parkes's excellent work on "The Urine," and to the various works of Dr Beale.

We conclude with a few remarks on the urine of mammals generally. The urine of the Carnivora is clear, of a light-yellow color, a disagreeable odor, a nauseous taste, and an acid reaction. It contains much urea, little pigment, and little or no uric acid. The urine of the Herbivora is turbid, yellow, of a less unpleasant odor, and alkaline. In addition to urea, it contains hippuric (but no uric) acid, alkaline lactates, carbonates of potash and of the earths, oxalate of lime, and a small quantity of phosphates. By reversing the natural food of these classes, we reverse the characters of the urine.

The urine in many forms of disease becomes turbid on cooling, and soon deposits a sediment; and even healthy urine, after a few days' exposure to the air, loses its clearness, and throws down a deposit of mucus and various kinds of crystals. The investigation of the nature of the deposits thrown down by comparatively fresh urine in disease, is a subject of the highest importance in medicine, and is noticed in the article **URINARY SEDIMENTS**.

U'RINE, Incontinence of, or *Enuresis*, is a troublesome affection, far more common in childhood than in more advanced life. The child may have no bad symptom of any kind that can be detected, but it is in the constant habit of discharging its urine in bed during sleep. It sometimes wakes with a consciousness that it is performing the act, but most commonly it is not disturbed. The act may take place once, or several times, during the night, and sometimes there is an interval of a night, but seldom more. The child may often be broken off this unpleasant habit by proper domestic management, as withholding any excess of fluids before going to bed, and by waking it, and making it discharge the contents of the bladder at the time when the elder members of the family retire to bed. When such means as these fail, recourse must be had to medical advice. Blisters to the sacrum, which prevent the patient from lying flat on the back, and consequently prevent the urine from gravitating towards the most irritable part of the bladder, are often useful; and cold douches to the spine, combined with the internal use of chalybeates, are frequently serviceable. The most certain remedy, however, is extract of belladonna, given at first, according to the age of the patient, in doses varying from 1-16th to 1/4th of a grain, twice daily, and increasing it, if required, till it gives rise to marked constitutional disturbance.

The various forms of mechanical pressure that have been suggested, with the view of preventing the passage of the urine, cannot be too strongly reprobated.

U'RSA MAJOR, "the Greater Bear," and *Ursa Minor*, "the Lesser Bear," are two celebrated constellations in the northern hemisphere of the heavens. *Ursa Major* was distinguished as early as the time of Homer by the names *Arktoe* "the Bear," and *Hamaza*, "the Wagon," the vivid imagination of the Greeks discovering a fanciful resemblance between these objects and the group of brilliant stars in this constellation. The Roman name *Ursa* was a translation of the Greek *Arktoe*; the Romans also called its seven bright stars the *Septentriones*, "the seven ploughing oxen," whence the adjective *septentrionalis* came to signify north. The common names throughout Europe for these seven stars are "the Plough," "Charles's Wain," "the Wagon"—evidently derived from the classical epithets above mentioned. When the constellation of *Ursa Minor* was generally recognised, the adjective *magala*, "great," was annexed by the Greeks, and *major*, "greater," by the Romans, to the name of

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this constellation. The remarkable group of stars in the hinder part of the Great Bear being within 40° of the north pole, never sinks below the horizon of any place in a higher north latitude than 40° , a peculiarity alluded to by Ovid in his "Metamorphoses." It contains a considerable number of stars, 17 of which are easily visible by the naked eye; but of these, only one (α) is of the first magnitude, two (β and γ) of the second, and eight (among whom are δ , ϵ , ζ , and η) of the third. α and β are known as "the Pointers," from their use in detecting the Pole-star (q. v.). A line drawn from the Pole-star through η of the Great Bear, and produced its own length, passes close to the star Arcturus of the first magnitude.—*Ursa Minor* is less prominent in the heavens. It was also *Arktos* and *Hamaxa* among the Greeks, and *Arotus* and *Ursa* among the Romans, from the close resemblance of its chief star-group to that of *Ursa Major*; but was, besides, distinctively denominated *Kynosoura* or *Kynosouria*, and *Cynosura*, "the Dog's Tail," from the circular sweep, resembling the curl of a dog's tail, formed by three of the stars in it. The star α is the extremity of the tail of the Little Bear, at present the Pole-star (q. v.), is the brightest in the constellation, though only of the third magnitude.

According to the later mythical stories of the Greeks, *Ursa Major* was the metamorphosis of Callisto, one of Diana's nymphs, who, having violated her vow, and being transformed by her indignant mistress into a bear, was slain by her son Arcas, and afterwards transferred to the heavens as a constellation by Jupiter; Arcas being at the same time metamorphosed into Bootes, the *Arktophylax*, "Bear-warden," of the Greeks. According to the other but less common legend, which represents the seven stars of *Ursa Major* as the oxen of Icarus, *Arktophylax* became *Bootes*, "the Ox-driver."

URSIDÆ. See BEAR.

URSON (*Erythron dorsatum*), a quadruped nearly allied to the Porecupine, and often called the Canada Porecupine. The genus *Erythron* differs from *Hystrix* (Porecupine) in the flatter head, the shorter and not convex muzzle, the longer tail, and in having the quills short and half hidden in the hair. The U. is about the size of a small hare. It is found as far south as Virginia and Kentucky, and as far north as lat. 67° . Its quills are dyed by the Indian women, and worked into ornamental articles of various kinds.

URSULA, St, a celebrated saint and martyr of the Roman calendar, especially honored in Germany, and particularly at Cologne, which is the reputed place of her martyrdom. The legend substantially, in its present form, can be traced as far back as the end of the 11th or beginning of the 12th c., as it is found in the revised edition of the Chronicle of Sigebert of Gemblours (Pertz, "Rerum Germanicarum Scriptores," viii. 310), which was made between 1106 and 1111. According to this writer, U. was the daughter of the British king Deonatus; and on account of her distinguished beauty, was sought in marriage by the son of a heathen prince who was originally named Holofernes, but afterwards, when a Christian, was called Ætherius. Her father was forced to yield to the demand; but U. made it a condition that her suitor should become a Christian, and that she should be allowed a space of three years, during which she proposed, in company with her maidens, to each of whom should be assigned a thousand companions, and a three-oared galley to convey them, to make a voyage of pious pilgrimage. The conditions were accepted; the maidens, to the number of 11,000, were collected from all parts of the world; and at length the expedition set sail from the British coast. Arriving at the mouth of the Rhine, they sailed up the river to Cologne, and thence upwards to Basel, where, leaving their galleys, they proceeded by land to visit the tombs of the apostles at Rome. This pilgrimage accomplished, they descended the river to Cologne, which, however, had meanwhile fallen into the hands of an army of Hunnish invaders, under the leadership of a chief, who, although not named, is plainly the Attila of history. Landing at Cologne in ignorant security, the pious virgins fell into the hands of these barbarous heathens, by whom they were all put to the sword, with the exception of U., who, for her beauty's sake, was reserved as a prize for the chief. She, too, however, as well as another maiden, who had at first concealed herself in terror, demanded to join her companions in martyr-

dom; and thus the full number of 11,000 victims was made up. Heaven, however, interposed. A host of angel warriors smote the cruel Huns; Cologne was again set free; and in gratitude to their martyred intercessors, the citizens erected a church on the site still occupied by the church now known under the name of St Ursula. Such is the legend as told by Sigebert, although it has undergone some modifications in later hands. The improbabilities and anachronisms of this legend were early observed; and it became the subject of an animated controversy soon after the Reformation. On the one hand, the centuriators of Magdeburg exposed its weak points with unsparring severity; on the other, a Jesuit father, Crombach, devoted an entire folio volume to the vindication of the substantial truthfulness of the narrative. Many suggestions have been offered as explanations of its most startling improbability—viz., the alleged number of the martyred victims, 11,000. One of these is, that this belief arose from the name of a virgin who was really the companion of U.'s martyrdom—*Undecimilla*. The record of the martyrdom in the calendar thus being "*Ursula et Undecimilla VV.*" "*Ursula and Undecimilla Virgins*," was easily mistaken for "*Ursula et Undecim millia VV.*" "*Ursula and eleven thousand virgins*."

Secular inquirers into the origin of the U. legend deny that it has the slightest foundation in any historical facts. They find the first traces of the reverencing of these virgins in martyrologies and missals of the latter half of the 9th c., in which mention is made either of a very small number of virgins whose names are given, or a larger indefinite number without names. In one metrical martyrology of this period, by Wandalbert, a monk of Prüm, they are already spoken of as thousands; and after the end of the 9th c. the number of 11,000 is found in the calendars. The name of U., however, does not occur till after the 10th c.; and it was not till the 12th c., that the reverence for U. became predominate over that of the associate virgins. With the 12th c. begins the discovery of the sacred bones. The *ager Ursulinus* was revealed by a vision in 1106; and at first, single skeletons were raised with the greatest solemnity; but beginning with 1155, the digging up of the field was carried on systematically for nine years, in the course of which thousands of skeletons were found, male as well as female, besides coffins, stone tablets with inscriptions, and the like. What the several relics were was revealed to a nun, named Elisabeth, then living in the diocese of Trier, to whom the holy martyrs appeared in visions. In this way were identified a pope of the name of Cyriacus, an archbishop, several cardinals, bishops and priests, and also Ætherius, U.'s bridegroom, along with whose title the cross, a crown, and other royal insignia were represented. It was also explained how all these men came to be in the company of the pious virgin. Even the children's bones found among the others were accounted for by revelations made forty years later to an abbot at Arnaberg, which confirmed and supplemented those of Elisabeth. The numerous human remains found in the Ursulan field at the north side of the city have been accounted for by antiquaries, by making it out to have been the burying-ground of the ancient Roman *Colonia Agrippina*. The origin of the legend is accounted for by Schade in his work "*Die Saga von der Heiligen Ursula*" (Han. 1854), on the theory that it is a Christianized relic of old German paganism. In which U. has taken the place of the ancient goddess worshipped by the Scandinavians as Freya (q. v.), and still remembered by the German people under the names of Berchta (q. v.), Hulda (q. v.), &c., and in Sweden by the very title of "*Old Urschel*."

But without pursuing further this curious inquiry, it will be enough to say, as concerns the Roman Catholic view of the matter, that while the most learned of the Catholic hagiographers, putting aside the idea of a directly and intentionally invented narrative, have traced the origin of the legend to a real historical massacre of a very large number of Christian maidens, which took place during the invasion of Attila, and soon after the celebrated battle of Châlons in 451, all the modern writers of that church are agreed in regarding the details of the narrative, the number, the pilgrimage to Rome, the interposition of the heavenly host, etc., as legendary embellishments of the medieval chroniclers.—See, for the full exposition and vindication of the history, Crombach, "*Ursula Vindicata*" (fol. Colonia, 1647); and for a more critical exposition of the historical foundations on which it rests, Buterim's "*Calendarium Eccles. Germ. Colou.*" (Cologne, 1834), and the "*Zeitschrift für Phil. und Kathol. Theologie*" (1850), Heft 2.

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URSULINES, a religious order of females in the Roman Catholic Church, taking their name from the saint and martyr who forms the subject of the above article. They take their origin from Angela Merici, a saint, of the modern church, born, according to the more received account, at Desenzano, in the latter part of the 15th century. She formed at Brescia an association of young females who bound themselves by a vow to labor for the tending of the sick, the instruction of children, the relief of poverty, and other such works of charity. After a time, a rule, in twenty-five chapters, was projected by Angela and finally approved by the Bishop of Brescia, Cardinal Francis Cornaro. Angela was herself chosen as the first superior, in the year 1537, the community even at that time numbering as many as 76 sisters. During the lifetime of Angela, and for more than twenty years after her death, which occurred in 1540, the congregation was confined to the diocese of Brescia; but in the year 1563, a house was opened at Cremona; and with the approval of Popes Gregory XIII. and Clement VIII., it was spread over many dioceses of Italy. It was warmly encouraged by St Charles Borromeo, and at his death there were no fewer than 98 convents of the order in his diocese, comprising above 600 nuns. Soon afterwards, it was established in France, where one of its most distinguished members was the celebrated sister, Madeline de St Beuve. It was in France that the sisters, although from the beginning they had been engaged in teaching, first formally added to their religious vows that fourth vow to devote themselves to the instruction of female children, which has since formed the great characteristic of the order. They were introduced into Savoy by St Francis de Sales in 1635; and in 1639, a convent was opened in Quebec, in Canada. About the same time, they were introduced into Germany—at Vienna in 1600, and at Freiburg, Kitzingen, and Prague soon afterwards—where they have continued to teach with great success; and their convents in various parts of Germany, but especially in Austria, at present number 86. The Ursuline sisters have several educational establishments in Ireland, in England, and in the United States, and may fairly claim the merit of having been mainly instrumental in maintaining among Catholics the education of female youth of the higher order through the 17th and 18th centuries. They have found many competitors among the younger sisterhoods of modern times.—See "Journal des Illustres Religieuses de l'Ordre de Ste Ursule," 4 vols. 4to (1690); "Chroniques de l'Ordre des Ursulines," 2 vols. (Paris, 1676).

URTICA'CEÆ, or Urti'ceæ, a natural order of exogenous plants, consisting of trees, shrubs, and herbs, natives of almost all parts of the world. According to many botanists, the order includes about 600 known species; whilst others, restricting it by separating from it several distinct orders, reduce it to about half that number, of which the common nettle may be regarded as the type. The leaves of all are alternate, furnished with stipules, and generally very rough, sometimes with stinging hairs. The inflorescence is various; the perianth usually divided, but sometimes a mere scale; the stamens inserted into the perianth, equal in number to its segments, when it is divided, and inserted at their base; the ovary free, one-celled, containing a single ovule. The fruit is a kind of nut, surrounded by the persistent and sometimes fleshy perianth, sometimes winged; and sometimes the fruits are variously aggregated. Under this description are comprehended *Cannabinaeæ* (q. v.), *Ulmaceæ* (q. v.), *Moraceæ* (q. v.), and *Artocarpaceæ* (q. v.), as well as the restricted U., which have filaments curved in bud, and turning backwards elastically when the anthers are bursting, the fruit an unopening nut. The juice of the restricted U. is watery, not milky; the wood in the arborescent or shrubby species, which are all tropical, is remarkably soft and light. The fibre of the bark of some is valuable. It is amongst the restricted U. that species covered with stinging hairs are found. See **BOHEMIA**, **NETTLE**, **NETLEBERRY NETTLE**, and **PELLITOUT**.

URTICA'RIA. See **NETTLE-RASH**.

URUGUAY, otherwise Banda Oriental del Uruguay—I. e., "the Eastern Bank of the Uruguay," is a small South American state, bounded on the n. and n.-e. by Brazil, on the e. and s.-e. by the Atlantic, on the s. by the Rio de la Plata, and on the w. by the Uruguay. It is nearly square in shape, and its greatest length and its greatest breadth are over 300 miles. Area, 71,752 sq. m.; pop. (1876) 445,000. The interior of U. is very imperfectly known. In the south, all along the Rio de la Plata, and as far north as the Rio Negro, the country is a sort of terraced upland, with a

bold, broken, treeless coast-line, possessing some excellent harborage; while the shores facing the Atlantic are low and sandy. Further east, rises a woody plateau; but high, bare, grassy plains, traversed by ranges of low hills, seem to be the predominant feature. The climate is mild; rain falls pretty copiously in winter, but is rare in summer. The most important rivers are the Rio Negro, the Duñman, the Arapey, the Yaguaron, and the Sebulati. Agriculture is in a very backward state, although the soil is naturally rich. Small quantities of wheat, maize, barley, rice, peas, beans, flax, hemp, and cotton are raised, and fruit trees thrive well; but the wealth of the country consists in its splendid pasturage, which supports great herds of horned cattle, horses, and sheep. The wool of these Uruguayan sheep is of a superior quality. The wild animals embrace the tapir, deer, ounce, monkey, paca, rabbit, and fox; and large packs of wild dogs infest the plains. U. has almost no manufactures, and very little commerce, as yet. The chief exports are jerked and salted beef, tallow, hides, horn, and hair; and the chief imports woollen goods, household furniture of all kinds, sugar, cordage, agricultural implements, timber, &c. The value of the imports in 1875 amounted to about £3,000,000; and that of the exports to about £2,500,000. Nearly all the imports and exports pass through Monte Video (q. v.), the capital. The towns of note besides the capital are Maldonado and Colouin del Santo Sacramento.

U. was originally colonised by Spanish settlers from Buenos Ayres, on the other side of the La Plata; but the territory which forms the natural limit of Brazil on the south was claimed by Portugal, and a war ensued between the two nations for its possession, which terminated in favor of Spain. U. was now attached to the vice-royalty of Buenos Ayres, and received the name of *Banda Oriental*—i. e., as has been explained above, the country on the eastern bank of the Uruguay. Its independence was secured by treaty in 1828, when it took the title of *Republica del Uruguay Oriental*; but like most of the South American republics, it has suffered incessantly from internal discords.

URUMEYAH, Urumijah, Urmea, Lake, called also the *Lake of Maragha* (q. v.), *Lake of Tabriz*, and by the neighboring peoples, *Kaputa* (Armen. *kapoti*, blue), the principal lake of Persia, is situated in the west of Azerbaijan, about 34 miles west from Tabriz. The lake, which is 4590 feet above sea-level, is about 50 miles in length from north to south, has an average width of 25 miles, and contains more than 1900 Eng. sq. miles. It is one of that class of lakes which receive, but do not emit streams; and despite the fact that its feeders include such rivers as the Ajl-su, 180 miles long; the Jaro-tu, 140 miles long; and the Ta-tu, 90 miles long, it has only an average depth of 13 feet. The water is largely impregnated with saline substances (according to one authority, the salts constitute 25 per cent. of the whole weight), and is so heavy as to be little ruffled by the strongest wind. No fish or mollusca are found in it. Six large isles, and a multitude of islets and rocks, shew themselves just above its surface, being mostly grouped together near its centre. The lake is fast drying up, leaving a gradually widening beach of thick saline incrustation, which supplies with salt the whole of Kurdistan. The lake was known in ancient times as *Mattiana*, or *Mantiana*.

URUMEYAH, a town of Persia, situated 10 miles west of the lake, in a wide and fertile plain, is surrounded with a mud wall and moat, but has no gates. Extensive fruit and vegetable gardens are situated both within and without the walls. The houses of the better classes are lofty, spacious, and sumptuously furnished; and many of those of the poorer classes are tastefully adorned with flowers and vines. U. is the residence of a Persian governor, of a Nestorian bishop, and of an American mission; it has a pop. of about 50,000, a large number of whom are Nestorian Christians and Jews. U. was anciently known as *Thabarna*, or *Thabarnæ*, and was held in great veneration by the Persians, by reason of the legend which fixed it as the birthplace of Zoroaster (q. v.). In 624 A.D., the town, including a magnificent fire-temple, was destroyed by the Emperor Heraclius.

U'RUS, a great animal of the ox-kind, which anciently inhabited the forests of Central Europe, and is described by Cæsar ("Bell. Gall." vi. 28) as common in the great Hercynian Forest; as scarcely less than an elephant in size—as evident exaggeration—but otherwise resembling an ox, of great strength, of great swiftness, and of great fierceness. He mentions that the horns were very different from those

of the oxen of Italy—large, spreading, and sharp. This character is found in the wild cattle of Chillingham and other parks in Britain, and in some of the Highland breeds of oxen; and the probability seems to be that the U. was the wild original of the domestic ox, and not a bison, nor any now extinct species, although some authors, apt to constitute species upon very slight grounds, maintain a contrary opinion.

URVAST. See PURURAST.

USBEGS, or Usbeks, a people of Turkish race, who, at the close of the 15th c. of the Christian era, invaded and conquered the numerous principalities into which Turkestan was at that time divided, and have ever since maintained dominion over the country. At the present day, they are for the most part a settled people, occupying themselves in the cultivation of the soil and in trading, and are scattered over Russian, Independent, and Chinese Turkestan. The most probable supposition regarding their origin is that they immigrated from Kipchak (q. v.), and assumed the name of U. from Usbeg, one of their chiefs. The U. of Khiva, Bokhara, Khokan, and of Chinese Turkestan, differ from each other in language, manners, and customs. Those of Khiva speak a dialect of the Turkish, are honest and generous, and destitute of the treachery and duplicity which are so characteristic of oriental civilisation, are passionately fond of music and poetry, and, though zealous Mohammedans, still retain many of their ancient heathen usages. They pride themselves much on the purity of their Usbeg descent, but most of them shew evident traces of an admixture of Iranian blood. The U. of Bokhara have become largely mingled with the Tajiks, and have consequently lost many of their national characteristics. Those of Khokan are very different from the two previous, and are as much Kirghis, Kipchaks, and Kalmucks as they are U.; the fact that the U. have been the dominant race in Turkestan for three centuries and a half, having given the name such a prestige of nobility and good-breeding, that it is generally assumed by such members of other races as settle in cities.

USE AND OCCUPATION is the technical name given in the law of England to the beneficial enjoyment of premises by a tenant, who occupies the real property of another, such as houses and farms. In all cases where a person has had use and occupation of another's premises, with the assent of the owner, an action lies for the value thereof, which value corresponds to rent under an ordinary lease. Hence, where it is doubtful whether there has been a valid lease executed between the parties, the landlord can nevertheless recover rent under the head of use and occupation.

U'SEDOM, an island belonging to Prussia, lies at the mouth of the Oder, and together with the island of Wollin, shuts off the Stettiner Haff from the Baltic. It is of very irregular shape, being much indented by branches of the Haff, is 24 miles in extreme length, and 15 miles broad. Area about 148 sq. m. On its north-east side is the port of Swinemünde (q. v.); on the south side is the small town of Usedom, with about 1800 inhabitants.

USES, in the law of England, is the old name for trusts, which has superseded the other in most respects. Uses and trusts correspond to the *fidei commissum* of the Roman law. A use was a confidence reposed in another who was a tenant of the land, or *terra-tenant*, that he should dispose of the land according to the intention of the *cestui que use*, or him to whose use it was granted, and suffer him to take the profits. See TRUST.

U'SHANT (Fr. *Ouessant*), an island in the Atlantic Ocean, belongs to France, and is included in the dep. of Finistère, from the west coast of which it is distant about 17 miles. It is the largest of a small group of islets called the *Iles d'Ouessant*, has an area of 7 sq. m., and contains about 2400 souls. The coasts are escarped and difficult of access; the soil is fertile. The inhabitants are employed in fishing, and in rearing cattle and horses.

USHAS (from the Sanscrit *ush*, "to shine, to burn," and kindred with the Greek *ēos* or *hēos*, and the Latin *aurora*). "the Dawn," is one of the female deities of the Vedic religion of India (see INDIA, sec. Religion), and amongst these is invoked with special predilection by the poets of the R'igveda hymns. The invigorating in-

fluence which the dawn exercises on body and mind, and the luminous and other phenomena connected with the beginning of the day, form the subject of some of the best portions of Vedic poetry; and out of them Ushas arises as one of the most pleasing goddesses of the ancient Hindu pantheon. She is invoked as "the affluent," as "the giver of food," and "the bringer of opulence;" she is asked to bestow on the pious "riches with horses and cattle," "posterity and troops of slaves;" and she is praised for the many boons she has showered on the worshippers who were liberal to her. She is the goddess "endowed with an excellent intellect," and the "truthful," or fulfiller of her promises. "She animates the diligent;" when she appears, "bipeds and quadrupeds (are in motion)," "the winged birds flock around from the boundaries of the sky," and "men who have to earn their bread quit their homes." She rides in a "golden chariot," which is "ample and beautiful;" and the Sanscrit word *go* meaning a cow (or, as a masculine, an ox), and also a ray of light, she is not only "the mother of the rays of light," or attended by them, and rays of light are her banner, but her chariot is drawn by "reddy *kine*," or, as they are sometimes called, "reddy oxen." Less frequently she is spoken of as travelling with horses; for the horse, as a symbol of light, is more especially appropriated to the god of the sun. The relation of Ushas to other Vedic deities is of a twofold, a physical and a ritual, character, inasmuch as the phenomena of dawn are connected with other phenomena of nature, and as certain religious ceremonies are performed at daybreak. On these grounds, she is frequently addressed as "the daughter of heaven;" and when her "parents," are spoken of, the commentator explains this word as implying "heaven and earth." She is further called the daughter of night (night being the precursor of the dawn); but, on other occasions, she is also spoken of as having night for her sister. She is, besides, the sister of the two luminous deities, *Bhaga* and *Varuna*, and the faithful wife of *Surya*, the sun. According to an old commentator (*Yaska*), she would in one passage of the *Rigveda* also be the deity "who has the sun for her child," "either because the sun is her companion, or because he absorbs the moisture (i. e., the frost);" but as *rasa-adakṣa*, the word, so interpreted, admits also of another rendering, it is doubtful whether she bears this epithet, the more so as in another passage the sun is said to follow Ushas as a man follows a woman. The *Asvins* being the luminous twin-gods, who probably represent the transition from darkness to light, and therefore that intermingling of both which becomes inseparable (see John Muir's "Contribution to a Knowledge of the Vedic Theogony and Mythology," in the "Journal of the Royal Asiatic Society," new series, vol. II., 1866), Ushas is called their "friend"—according to *Sāyan'a*, also their sister; she "follows their lustre," and "awakes" them to partake of the Soma prepared for them; and in their turn they are asked "to unite with the dawn." Another god, who originally on physical grounds is associated with Ushas, is *Indra* (q. v.), the ruler of the bright firmament. He "generates (i. e., causes to appear) sun and dawn," and "appoints them to their office," which is that of dispelling darkness; but though, "when (in the morning), desiring (the Soma), he honors the dawn," his ascendancy during the day becomes fatal to her; for then "he slays her," "breaks her chariot;" and "her shattered chariot reposing on (the banks of) the river *Vipra*, she departs from afar." Most of these deities become, in consequence, associated with Ushas also as sharer in certain sacrifices which are offered to her; and besides these, *Agni*, the god of fire, who carries the offerings to the gods, and *Soma* (q. v.). Like many of the most poetical deities of the Vedic creed, also Ushas is excluded from the Hindu pantheon of the classical period. Her place is there taken by *Arun'a* (the ruddy), whom the epic poems and the *Purāṇa*s make the son of the patriarch *Kasyapa* and his wife *Vinatā*, and the younger brother of *Garuḍ'a*, the bird-vehicle of *Vishnu*. According to the "*Mahābhārata*," he was appointed by the gods to the office of charioteer of the sun, in order to intercept his fiery heat, when the sun, angry with the gods for being exposed to the enmity of *Rāhu* (q. v.), it was feared, would consume the world. Where represented, *Arun'a* is therefore seated before the sun on his chariot, driving his horses; but as the legends deprived him of his legs, his body is seen perfect to his knees only.

USHER, James, Archbishop of Armagh, and by common consent the most learned prelate that ever adorned the Irish Protestant Church, belonged to one of the oldest Anglo-Irish families, and was born in Dublin, January 4, 1650. His father,

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Arnold Usher, one of the clerks in Chancery, was a gentleman of good estate, and his uncle, Henry Usher, preceded him in the archbishopric of Armagh. At the age of 18, he entered Dublin College, where his predilection for history soon revealed itself. Having resolved to devote himself to the service of the church, he proceeded, after the solid fashion of the times, to read up the entire literature of ecclesiastical antiquity—a task which occupied him from his twentieth to his thirty-eighth year! In 1601, he was ordained deacon and priest, and was shortly after appointed preacher at Christ Church, Dublin. In 1607, he was chosen to the chair of Divinity, a post which he held for 13 years. In 1609, he made one of his numerous visits to England, in the course of which he made the acquaintance of the most distinguished scholars of the age. In 1618, his first publication appeared, entitled "*De Ecclesiarum Christianarum Successione et Statu*," which was designed as a continuation of Bishop Jewel's "*Apology*." The work was divided into three parts, of which only the first, reaching to the period of Hildebrand, and part of the second, were finished. In 1615, he was appointed, by a convocation of the clergy held at Dublin, to draw up a series of articles (the number amounted to 104) relating to the doctrine and discipline of the Irish Protestant Church, in which the doctrines of predestination and reprobation (of which U. was an unflinching apologist) found prominence. These and other views, such as, that bishops were not a different order from presbyters, that the Sabbath should be strictly enforced, that no toleration should be granted to Catholics, laid him open to the charge of Puritanism; but as his loyalty to the principle of monarchy was undoubted, he suffered no diminution of the royal favor; on the contrary, King James promoted him to the bishopric of Meath in 1620; and in 1623, constituted him a privy-councillor of Ireland. Two years later, he was raised to the highest ecclesiastical dignity in the kingdom, the archbishopric of Armagh, and in his official capacity "vigorously" opposed the toleration of popery and the spread of Arminianism. In 1633, U. published "*Veterum Episcoporum Hibernicarum Epistole*," a collection of letters out of several ancient MSS., concerning the state of the Irish Church from 593 to 1180; in 1638, "*Emmanuel, or a Treatise on the Incarnation of the Son of God*;" in 1639, "*Britannicarum Ecclesiarum Antiquitates*," which is said to contain "a most exact account of the British Church, from the first planting of Christianity, twenty years after our Saviour's crucifixion, down, both in Britain and Ireland, to the end of the seventh century;" in 1641, "*The Judgment of Dr Reynolds concerning the Original of Episcopacy defended*," "*The Original of Bishops*," "*The Power of the Prince and the Obedience of the Subject*," &c. When the Civil War broke out, U., who was in England at the time, espoused the side of the king, refused to sit, when nominated, among the Assembly of Divines at Westminster, and made himself very obnoxious to the parliament by the sermons which he preached at Oxford. When the fortunes of the king began to decline, U. left Oxford; his property and revenues in Ireland were seized, and after a residence in Wales and elsewhere, he came to London in 1647, where, in spite of his royalist sympathies, he was chosen by the benchers preacher of Lincoln's Inn, a post which he retained till his death, March 21, 1658. Cromwell, who had a great respect for his learning, ordered his remains to be interred with great magnificence in Erasmus's Chapel in Westminster Abbey. U. was a man of undoubted ability and of enormous erudition, pious and free from worldly ambition; but he lacked force of character, real insight and intellectual power; hence, though pronounced by Dr Johnson "the great luminary of the Irish Church," he exercised less influence over the course of contemporary events than the humblest of Cromwell's Ironsides. Nor can it be shown that posterity is very deeply indebted to him for more than the example of a virtuous and studious life. U.'s chief works, besides those already mentioned, are his edition (1644) of the "*Epistles*" of Polycarp and Ignatius; his treatise "*De Romanæ Ecclesiæ Symbolo*" (1647); "*Dissertatio de Macedonum et Asianorum Anno Solari*" (1648); and "*Annals of the Old Testament*" (1650—1654), a chronological work. After his death, there were published (from his numerous MSS.), "*Chronologia Sacra*," &c. (Oxford, 1660), by which and his "*Annals*" he is most widely known; a volume of "*Sermons*;" "*Historia Dogmatica Controversiæ inter Orthodoxos et Pontificios de Scripturæ Sacre Veracitate*" (Lond. 1690); "*A Collection of three hundred Letters written to James Usher, Lord Archbishop of Armagh*," to which is prefixed a life of the archbishop by his chaplain, Richard Farr, D.D.

(*London*, 1696). A collected edition of U.'s works, in 16 vols., with a new biography, was published at Dublin in 1841, by Dr Eirlington.

USHER OF THE BLACK ROD, one of the officers of the order of the Garter (q. v.), coeval with the institution of the order, and originally called "*Hostiarius capelle regis infra castrum de Windsor*." The rod from which his title is derived is of ebony, mounted with gold, 8½ feet in length, having at the top a lion sejant, holding before him in his fore-paws a gold shield charged with the Royal cipher in gold surrounded with the Garter. He has a mantle like that of Garter King of Arms, and his badge is a gold knot surrounded with the Garter, and ensigned with the royal crown. It is the practice to unite this office with that of the king's first gentleman usher daily waiter at court, who is one of the chief officers of the House of Lords. In this capacity, it is one of the functions of the Gentleman Usher of the Black Rod, or of his deputy, who is known as the Yeoman Usher of the Black Rod, to desire the attendance of the Commons in the House of Lords when the royal assent is to be given to bills by the sovereign or Lords Commissioners; also to execute orders of commitment for breach of privilege and contempt, and to assist at the introduction of peers, and other ceremonies of the Upper House.

USHER OF THE GREEN ROD, one of the officers of the order of the Thistle (q. v.), whose duties consist in attendance on the sovereign and knights when assembled in chapter, and at other solemnities of the order. The rod from which the title is taken is of green enamel, three feet in length, ornamented with gold, having on the top a unicorn of silver, holding before him an escutcheon charged with the cross of St Andrew.

U'SKUP, or *Sco'pla*, a town of European Turkey, in Monastir, on the Vardar, 120 miles north-west of Salonica. The town, which is built on hilly ground, contains 16 mosques, with black domes and minarets, interspersed among fruit trees. Here are the ruins of an ancient Roman aqueduct, consisting of 55 arches. Leather is manufactured. Pop. estimated at 10,000.

U'SNEA, a genus of lichens, having a much branched thallus, with an elastic thread in the centre. Some of the species are natives of Britain. They grow on trees, and are generally pendulous. They contain the vegetable principle called *Usnina*, which, however, is also found in many other lichens. They are sometimes used in dyeing, like archil and cudbear. From their appearance, many of the species of U. receive the popular name of *BEARDMOSS*.

USTILA'GO. See *SKUT*.

U'SUFRUCT, in Scotch Law, is adopted from the Roman law, to denominate one of the three personal servitudes, which were use, usufruct, and habitation. Usufruct is better known under the name of *Liferent* (q. v.), or *Estate for Life* (q. v.).

U'SURY. See *INTEREST*.

UTAH (named from an Indian tribe, *Utah*, or *Yuta* [*Utes*?], dwellers in mountains), a territory of the U. S., lying between lat. 37°–42° n. and long. 109°–114° w., containing 87,476 square miles, bounded north by Idaho and Wyoming; east, by Colorado; south, by Arizona; and west, by Nevada. Its chief town and capital is Salt Lake City (q. v.). U. is an immense basin, 4000 to 5000 feet above the level of the sea, surrounded by mountains, which at some points reach the altitude of 8000 to 10,000 feet. Excepting the Green and Grand rivers, in the east and south-east, Santa Clara river in the south-west, and the head-branches of the Colorado, which flows through a cañon 1200 feet deep, its rivers empty into the Great Salt Lake, in the northern centre of the territory, and similar salt lakes or inland seas. This great valley, which includes the new territory of Nevada, is formed by a branch of the Rocky Mountains on the east, and the Sierra Nevada on the west. The formations are primitive and metamorphic, with secondary basins 15 or 20 miles wide. The principal mountains lying within the territory are the Humboldt range, 6600 feet high, in the west, and the Wasatch in the south, 12,000 feet. There are numerous lakes, many thermal springs and salt spring. The rocks are mostly primitive, and rich in granite, Jasper, syenite, porphyry, and quartzes, shewing everywhere evidences of volcanic action. There are also ridges of carboniferous limestone-containing calcareous spar; and near Salt Lake City occur boulders of serpentine, fine gray granite, sand-

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stones, conglomerates, talcose and striated slates, gypsenm, limestone, and marble of every hue in large masses. Iron is abundant; and there have been found gold, silver, copper, zinc, lead, inexhaustible quantities of bituminous coal, sulphur, alum, borax, and petroleum. Among the animals are the antelope, elk, deer, Rocky Mountain sheep, cougar, catamount, wolves, foxes, beavers, porcupines; quail, grouse, swans, wild geese, pelicans, ducks; perch, pike, bass, and salmon-trout of 30 lbs. weight. Generally, vegetation is not luxuriant, and timber, except pines and firs in the mountains, scarce. The country has good grass for grazing, and some wild fruits. The climate is bleak and changeable, with deep snows and intense cold in winter, and heats in summer, accompanied with storms of thunder and dust. The soil, as a whole, may be described as barren, with spots of remarkable fertility, producing 60 to 100 bushels of grain to the acre. Much of the soil is strongly alkaline. The chief crops are wheat, oats, barley, maize, buckwheat, flax, hemp, fruits. Cattle and sheep are abundant. The chief manufactures are those required in a new country, as farming-implements, furniture, carriages, woollen goods, leather, steam-engines, and machinery and cutlery, in which are employed a large number of skilled English artisans.

The pop. of U. consists almost entirely of Mormons (q. v.), governed by a hierarchy, of which Brigham Young (q. v.) was long the head. In 1860, the pop. was 40,295; in 1880 143,993 (besides Indians). Most of the Mormons come from Great Britain, and many are from Sweden and the north of Europe. Latterly there has been considerable increase by immigration of the "Gentile" or non-Mormon population. Provision has been made for education in the foundation of the university of the state of Deseret—the name under which they propose to come into the American Union—a free academy, and common schools. There are many newspapers. There is a United States territorial government, with governor, secretary, marshal, and judges, appointed by the president, and a legislative assembly, elected by the people. In 1875, there were 504 miles of railway, the Central Pacific Railway passing through Northern Utah.

The Shoshone, Snake, and Yuta Indians number about 1200, mostly hostile to the white settlers.

UTERUS. See WOMEN.

UTICA, a city of New York, U.S., on the Mohawk River, at the junction of the New York Central and Utica and Black River Railways, and the Erie and Chenango Canals, 36 miles west-north-west of Albany. The city, regularly and handsomely built, rises from the south bank of the river to an elevation of 150 feet. Among its buildings are a city hall, public halls, 34 churches, 6 large hotels, 4 banks, a cotton mill, 2 woollen mills, a state lunatic asylum with 500 patients, Catholic and Protestant orphan asylums, academies, and schools. There are also manufactures of flour, starch, organs, pianofortes, clothing, carriages, machinery, carpets, oil-cloth, &c.; and 11 newspapers and periodicals, of which 2 are Welsh and 1 German. At the period of the revolution, U. was a frontier trading-post, and the site of Fort Schuyler, built to guard the settlements against the French and Indians. In 1813, it had a pop of 1700; and in 1880, of 33,914.

UTILITARIANISM, the name of the peculiar theory of Ethics, or of the ground of moral obligation, that adopts, as the criterion of right, the happiness of mankind. The word "Utility" was employed, in this acceptation, by Jeremy Bentham; the form "Utilitarianism" was first used by John Stuart Mill.

The doctrine of Utility is opposed to all those theories that refer us to some internal sense, feeling, or sentiment, for the test of right and wrong; a test usually described by such phrases as a Moral Sense, and Innate Moral Distinctions. See ETHICS. Whence Utility is sometimes termed the *external* or objective standard of morality. It is also opposed to the view that founds moral distinctions on the mere arbitrary will of God.

The Utilitarian theory has been maintained both in ancient and in modern times, although with considerable variation, not merely in the mode of stating it, but in important peculiarities. Thus, in ancient times, it was held by Epicurus, but in a purely self-regarding form; each person's end was his own happiness exclusively, the happiness of others being instrumental and subordinate. The modern phase of the theory may be said to begin with Hume. He employed as the leading term of

his system, not Utility, but Benevolence; whereby he gave especial prominence to the disinterested side of moral actions. He strenuously maintained, what must be regarded as the essential feature of the Utilitarian doctrine, that no conduct is to be deemed worthy of moral approbation, unless, in some way or other, it promotes human happiness; and that actions ought to be visited with disapprobation, exactly according as they have the opposite tendency.

Jeremy Bentham is, more than any other person, identified with the theory of Utility, which was in his hands, not merely the foundation of Ethics, but also the basis and justification of political and legal reforms. Having in view the state necessity of sacrificing smaller interests to greater, or, at all events, of not sacrificing greater interests to smaller, he described the ethical end as "the greatest happiness of the greatest number." He illustrated the doctrine by setting it in opposition to *asceticism*, which he interpreted to mean that pleasure is forfeited, and pain incurred, without yielding a compensating amount of good, either to the agent or to other persons.

Paley advocated a form of Utility. He made the will of the Deity, enforced by future rewards and punishments, the impelling motive to duty; but in determining what that will was, in particular cases, he included a reference to the beneficial tendency of actions.

James Mill maintained substantially the views of Bentham. Sir James Mackintosh, while differing in some points from Bentham and from Mill, in the main adhered to Utility as the ultimate standard of right. John Austin, in his "Province of Jurisprudence Determined," has contributed a lucid exposition and a powerful defence of the principle. John Stuart Mill has devoted a separate work to the subject. Samuel Bailey, in his "Letters on the Human Mind," vol. iii., has discussed the ethical problem fully, and pronounced upon the utilitarian side. Herbert Spencer ranks among the upholders of the theory; and likewise Bain, in his edition of Paley (Chambers's series), and in "The Emotions and the Will."

Before stating the arguments for and against the principle of Utility as the basis of morals, it is proper to inquire what sort of proof an ethical system is susceptible of. Ethics is a practical science (see SCIENCE), and, as such, involves an end; having the peculiarity of being the final or comprehensive end of all human conduct. See TELEOLOGY. Now, in the speculative or theoretical sciences, *ultimate* principles cannot be proved; it is the nature of proof to rest one doctrine on some other doctrine, so we must come at last to what is taken without proof; we cannot prove our present sensations; nor can we demonstrate that what has been will be; we must take these things for granted. And so it is with ultimate ends in the practical sciences: we cannot prove that each person should seek his own happiness; we must assume it as an ultimate fact, and trace the consequences. The final end of all conduct cannot be reasoned; it must be gathered from the actual conduct of men; we must find by observation what ends men actually pursue, and, if we can, generalize them into one comprehensive statement. The function of argument in the case is to show where inconsistency has crept in, or to make professions accord with practice. Thus it is, that the supporters of Utility aver that men, even although refusing the theory, still proceed upon it in their conduct; and that the doctrine cannot be impugned consistently with the admitted motives of human action. Human beings, as a rule, have no other end in life but happiness, either for themselves or for others; and morality belies human nature if it does not accord with this universal object of pursuit.

Although Utilitarians hold that good and evil, right and wrong, are properly determined by a calculation of the consequences as regards human happiness, they do not all maintain that past or existing systems of morals have been on all points framed on this principle. Bentham and James Mill appear to have thought that the rule has always been kept in view, though often badly applied. But others, equally earnest in regarding it as the only legitimate rule, are of opinion that, in the past and existing ethical precepts, men have been guided partly by Utility, and partly by Sentiment—that is, liking or disliking for the act itself, irrespective of any further consequences. Thus, the veneration of the Hindu for the cow, on which ethical duties are founded, is an instance of sentimental liking; the Jewish and Mohammedan prohibition of the pig is a matter of sentimental dislike. In the ceremonial rites of abstinence, so widely prevalent, there is a certain shew of Utility, mixed up

with the fancy of cleanliness or purity. In the doctrine of the sacredness of kings, there is a combination of Utility and Sentiment.

The following are the chief objections to the utilitarian scheme, with the arguments in reply.

I. It is maintained that Happiness is not, either in fact or in right, the sole aim of human pursuit; that men actually, deliberately, and by conscientious preference, seek other ends. For example, virtue is an end in itself, to be sought whether it yield happiness or not, and even if it should be productive of the greatest misery. The qualification, however, is always added, that virtue, in the long run, without intending it, and all the more for not intending it, is the unfailing source of happiness.

To which the supporter of Utility answers:

1. It is quite true that men seek other ends than immediate happiness to themselves and to others, and that, in particular, they cultivate the virtues as ends in themselves, without always thinking of them as means to happiness. But, then, this is by the operation of a familiar law of the mind, whereby what was originally of the nature of means, comes at length to be valued as an end; such is the well-known case of the love of money. The virtues of justice and veracity are essential to human society, just as money represents the basis of subsistence; and by frequent association, the regard that we pay to the end is transferred at last to the means.

2. It may be shewn in many ways that the great social virtues derive their worth in our estimation from their subservience to human happiness, and not by any absolute title of their own. Take, first, Veracity or Truth, which, of all the moral duties, has most the appearance of being an absolute and independent requirement. A little consideration will shew that even this is not in our eyes an unlimited or unqualified virtue. Men have always approved of deception practised towards an enemy in war, to a madman, or a highway robber; also, secrecy or concealment, even although misinterpreted by others, is generally allowed—unless it leads to some pernicious result; while, if the divulgence of the truth were attended with harm, it would be universally reprobated. But an absolute standard of truth is incompatible even with secrecy or disguise; in departing from the course of perfect openness, or absolute publicity of thought and action, in every possible circumstance, we renounce ideal truth in favor of a compromised, qualified veracity—a following of truth only so far as is expedient.

Again, as regards Justice, the presence of considerations of Utility is equally obvious. There is no absolute rule of justice that does not bend to circumstances. If justice be defined, giving every one his own, or what he is entitled to, there is the show of an absolute rule; but, in reality, nothing is determined. The meaning is, to give to each what *law and custom* have declared to be a man's own. It is declared just for an elder son to receive a larger share of the parental estate than all the rest of the children put together; but it is clear that whatever justice there is in this, must be founded on some ground of expediency. (See on this subject, J. S. Mill's "Utilitarianism," chap. v.)

II. It is further objected to the adoption of Utility as the standard of Right, that the full consequences of actions are too numerous, involved, and complicated to be reduced to calculation; and that even where the calculation is possible, people have seldom time to make it.

To this, it is answered, first, that the primary moral duties refer to conduct that can be fully calculated to the satisfaction of any reasoning mind. Thus, to revert to the two leading examples, Truth and Justice: the habitual disregard of these duties would soon bring a society to utter confusion and ruin; without them, there could be no social co-operation; man would fall below the condition of the gregarious animals; the race could hardly be saved from extirpation. On the other hand, the observance of these duties, in a high degree, raises to a corresponding degree the means of human happiness. The balance of advantages is all on one side—there is no case for the other side at all.

There have always been moral rules or enactments where the calculation of consequences was much less easy; for example, the indissolubility of marriage is maintained in some countries, and not in others; and there have been considerable differences as to the forbidden degrees of affinity in marriage. In these usages, there are both advantages and disadvantages, and the preponderance is variously estimated by

calculators. In such cases, the utilitarian would say: Do not make a compulsory enactment restricting liberty, which restriction is an evil in itself, unless the balance of advantages is unquestionable and great.

As to the argument, that it is impossible to make the calculation of consequences every time we perform a moral act, the reply is, this is unnecessary: the calculations as to the various duties have been already made, and are embodied in rules, which rules we remember and apply without thinking of the process gone through in arriving at them. The navigator at sea does not need to compute the "Nautical Almanac" every time he determines his longitude; he carries it to sea with him ready for use.

III. A third objection is, that men in all ages have distinguished between the Right and the Expedient, that is, the Useful; the two are in most languages put in opposition or contrast. The reply is, that the Expedient, when thus opposed to the Right, commonly means what is expedient for the agent at the time, but is not expedient for people generally, or even for himself in the long-run. It is sometimes expedient, in this sense, to tell a lie, to rob, or to murder; but such actions are not expedient in the sense of general utility, or the greatest happiness of mankind.

It is further to be remarked in this contrast of the Expedient and the Right, that the Expedient may mean simply an addition to our conveniences or comforts, something that is well for us to have, but that we might do without. Thus, it is highly expedient to possess cheap postage, railways, and electric telegraphs. On the other hand, the Right points to the essentials of our existence; without the fulfilment of contracts, respect to life and property, obedience to law, society would be dissolved. The distinction was expressed in one of Cromwell's speeches, by the contrast of a nation's Being and its Well-being; what secures the one is emphatically the Right, the promotion of the other is the Expedient. Right is the highest and most imperative form of Expediency.

IV. A fourth objection against the utilitarian scheme is, that all useful things are not made obligatory; it may be useful to have railways, but it is not a duty of every man to make them. But the utilitarian, while contending that nothing should be made a moral duty but what contributes to the happiness of mankind, does not hold the converse, that whatever promotes human welfare is a moral duty.

So much for the objections. The positive ground for Utilitarianism is, that men actually recognise happiness as their paramount consideration, or highest end. This, as a general rule, is too obvious to require proof. Each one's plan of life is principally made up of ideas of happiness to self or to others. All our good wishes to one another are repetitions of the one idea, "May you be happy." The seeming exceptions have been noticed above.

One of the strongest confirmations of the doctrine is derived from the usual inducements to right conduct, common to all moralists. We find that no one can preach morality without making use of its bearings upon happiness. The very meaning of the terms expressive of the highest virtues—love, goodness, mercy, compassion, fidelity, honesty, integrity, justice—is something that relieves the pains, and augments the pleasures of sentient beings. To love is to make the object happier, and love is the fulfilling of the law.

Although there be duties occasionally imposed upon men that have no obvious tendency to increase happiness, but rather to diminish it, as the labors of some cumbersome ceremonial systems like Hinduism, those duties have to be upheld by the fear of punishment or the hope of reward, still testifying to the predominating motives of the human mind. It is not, however, by reference to traditional observances that the happiness motive is most clearly tested. The proper plan, as remarked by Mr Samuel Bailey, is to try it upon some fresh case, some entirely new enactment, when it will be found that the interest or happiness of the community is the sole consideration appealed to. If a new law of inheritance is proposed, or a new government Board constituted, nobody advances any other criterion but expediency, or the good of certain persons now or in the future; unless such expediency can be shewn, no one will move in the matter at all; and the earnestness of the promoters will be in exact proportion to their sense of the resulting good. We may, through blind conservatism, keep up usages not only destitute of utility, but productive of harm; but we should not now deliberately set up for the first time any practice that we did not regard as conducive to somebody's well-being. Traditional associations excepted, the

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strength of our approbation or disapprobation always follows our estimate of happiness or misery produced.

It is worthy of remark that Utility, or the promotion of human welfare, as it is the very meaning of the work of a public benefactor, expresses the sum of the labors of all the best men that have ever lived.

UTOPIA (Gr. *ou*, not; and *topos*, a place, equivalent, therefore, to "Nowhere") is the name given by Sir Thomas More (q. v.) to the imaginary island which he makes the scene of his famous political romance, "*De Optimo Reipublice Statu, deque Nova Insula Utopia*," originally published in Latin, at Louvain, in 1516, and translated into English by Bishop Burnett. This island, which More represents as having been discovered by a companion of Amerigo Vesputci, is the abode of a happy society, which, in virtue of its wise organisation and legislation, is free from the harassing cares, inordinate desires, and customary miseries of mankind. More's romance obtained a wide popularity, and the epithet *Utopian* has since been applied to all schemes for the improvement of society which are deemed not practicable—e.g., to those of Saint-Simon (q. v.) and Fourier (q. v.). Everything, however, is not Utopian that is called such. All the great changes that have taken place in the world have had to pass through a "*Utopian*" phase.

UTRAQUISTS (Lat. *utraque*, from *utraq̃ue*—i. e., *specie*, in both kinds), a name at first given to all those members of the Western Church, in the 14th c., principally followers of John Huss, who contended for the administration of the Eucharist to the laity under both kinds; but in later times restricted to one particular section of the Hussites, although all the members of that sect alike claimed this as a fundamental principle of their church discipline. The name may be said to date from 1415, when the followers of John Huss, in Prague, and elsewhere in Bohemia, adopted "the communion of the cup as their rallying cry, and emblazoned the cup upon their standards, as the distinguishing badge of the association. In 1417, the university of Prague, by a formal decision, directed that all the laity should communicate in both kinds; and the Council of Constance, in consequence, prohibited students from any longer resorting to Prague for the purposes of study. The Hussite party, on the contrary, made the demand one (the second) of the four points upon which they insisted as the condition of their submission to the church. Their demands were rejected by the Council of Constance; but the Council of Basel, in 1433, acceded to the demand for the cup, under the condition that, whenever communion was so administered, the ministering priest should accompany the ministrations with a declaration that Christ was contained whole and entire under each species. A portion of the Hussite party was content with the explanation of this and the other points offered by the council, but the more violent held out. See *Huss*. The former were called *U.*, and continued to be so designated. During the Reformation troubles, this division was still maintained. The *U.* were favorably regarded by the Imperial party; and after the battle of Mühlberg, in 1547, they alone were formally tolerated in Bohemia and Moravia. One of the most celebrated leaders was Jacobus v. Mies. The name *Utraquist* is still applied to certain districts or villages in Bohemia and Moravia; but it is used not in reference to this theological controversy, but merely to convey that, in these villages or districts, *both languages*, Bohemian and German, are spoken.

UTRECHT, a province of the Netherlands, bounded on the w. by South Holland, n. by North Holland and the Zuider Zee, e. by Gelderland, and s. by the Rhine and Lock. It is 43 miles from east to west, and 21 from north to south. Superficial extent, 346,405 acres: 62,500 of which are arable, 190,000 pasture, 89,000 in wood, the remainder waste land and water. The chief places are Utrecht, Amersfort, Rhenen, Wijk bij Duurstede, Montfort, and IJsselstein (pronounced I'sselstein). There are 66 country parishes, the number having been reduced from 86 by union. Pop. (1874) 181,957; rather more than 36 per cent. are Roman Catholics; the remainder, except 1611 Jews, are Protestants.

The country is varied by beautiful hilly districts, level fields, orchards, tilled land, meadows, and moss. The hilly tract stretches from near Amersfort to Rhenen on the Rhine, 21 miles. It is well wooded. Rye, oats, and buckwheat are sown; sheep, cattle, and bees extensively kept. To the south of this belt is rich clay land, producing excellent wheat and barley. Near Amersfort and Rhenen, tobacco is

largely planted, the crop of 1845 being 948,750 lbs. The stock amounted to 12,771 horses, 76,960 horned cattle, 32,997 sheep, 20,547 swine, 4678 goats, and 18,835 beehives.

U. is watered by the Rhine, Vecht, Leck, Amstel, Grebbe, and many other rivers. The inland fishing is trifling; but many herrings, eels, flounders, anchovies, &c., are taken in the Zuider Zee. Besides agriculture, the industries are soap-boiling, sawing wood, copper and iron founding, making machinery, carpets, tiles, bricks, coarse pottery, cement, &c. There are many beautiful country seats, the climate being dry and healthy.

UTRECHT (*Ultrajectum*, or *Trajectum ad Rhenum*), the provincial capital, is beautifully situated in the midst of a district composed of sandhills, woody heaths, rich grassy meadows, extensive orchards, flower-gardens, and cultivated fields. It lies 24 miles south-east from Amsterdam. When the census was taken (1849), the pop. numbered 56,999; in 1874 it was estimated at 64,271. The broad walks have been levelled, planted with trees, and formed into beautiful and well-kept promenades.

U. is favorably situated for trade, being the point from which several railways radiate, and having excellent water-communication by the Old Rhine and the Vecht. The staples are grain, cattle, and various manufactures. It is the residence of many noble families, the seat of a university, national veterinary school, national hospital, high military court, the mint, &c. Principal buildings are the cathedral or Domkerk, the town-house, the mint, the university, and several handsome barracks for the infantry and cavalry, especially the Willemskazerne. The cathedral was consecrated to St Martin about 780. In 1674, a hurricane destroyed the body of the building between the choir and the tower, so that the latter (321 feet high) is now isolated. The famous university of U., founded in 1623, numbers about 500 students, and has a good library. U. has been for centuries the headquarters of the Jansenist Church (q. v.). There is a national school, for military surgeons; a grammar-school; normal school for teachers; a musical college, for elementary singing, the piano, and violin; a historical society; meteorological institute; medical society; pharmaceutical society, &c. Education generally stands high.

The charitable institutions are numerous. Principal industries are—manufacturing tobacco and cigars, woollen fabrics and carpets, making salt, furniture, baskets, tin, copper, and silver work, sawing wood, rope-making, iron-founding, book-printing, &c. The royal cigar factory alone makes 40,000 daily.

U. is one of the oldest cities of the Netherlands, and probably was founded by the Romans. Here the famed union of the northern provinces for the defence of political and religious freedom was formed January 28, 1579. For a short time in 1807, Louis Napoleon, king of Holland, resided in Utrecht. It has been the birthplace of many distinguished men, among others Pope Adrian VI., in 1459.

U. has acquired a degree of celebrity for the treaties there concluded, which brought to a close the war of the Spanish Succession. See SUCCESSION WARS. After this disastrous conflict had endured for more than ten years, Great Britain, finding that the reasons which had prompted her to engage in it no longer existed, tried to induce Austria to come to terms with France, but failing in this, at once signed private preliminary articles for herself, October 8, 1711. On January 12, 1712, a congress was opened at U., and France, desirous, at almost any price, of detaching Britain from the grand alliance, voluntarily made so many concessions, that the latter had only further to demand the banishment of the elder Pretender, whose sojourn in France had been a source of disquietude, the conclusion of a treaty of commerce, and indemnities for her allies—all which points were at once conceded. But the preposterous demands of Austria, which included not only the renunciation by the Bourbons of the entire Spanish Empire, but the restoration of all those places which had been ceded to France by the treaty of Münster, Nimeguen, and Ryswick, and the retention of all Austria's conquests in Italy, the Low Countries, and Spain, forced the French to break off the conferences, in the hope of making a separate peace with Britain, and compelling the other allies, by negotiation or arms, to lower their pretension. This plan was successful: agreement on all points at issue was established between France and Britain in August 1712; and arrangements were also come to with Holland, Portugal, Prussia, and Savoy soon afterwards. As each of the contracting parties negotiated in its own name, no fewer than nine distinct treaties of peace were

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signed in the following spring, 11th April 1713. By the treaty between France and Britain, the former ceded St Kitt's, Hudson's Bay, Nova Scotia, and Newfoundland (the liberty of fishing for cod being reserved), recognised formally the reigning dynasty and the Hanoverian succession, agreed to demolish the fortifications of Dunkirk, engaged that the crowns of France and Spain should never be united, and that no part of the Spanish Netherlands should ever be ceded or transferred to France; and Spain renounced her Italian possessions in favor of Austria, and gave up Gibraltar and Minorca to Britain, with which power she also concluded the *Asiento* (q. v.) treaty. The chief of the special agreements with the other contracting parties were as follows: Ypres, Knocke, &c. to be exchanged with Holland for Donai, Bouchain, &c., and a treaty of commerce to be concluded; both banks of the Amazon to belong to Portugal; Spanish Gelders, and the district of Kessel, to be ceded to Prussia, and its ruler's title of king, assumed in 1701, formally recognised, Prussia in turn resigning all claims to the principality of Orange; the Duke of Savoy to obtain Sicily, with the title of king, &c. The treaty of U. did not make peace with Austria and the German Empire: but in the following year, at Rastadt and Baden, they agreed to substantially the same terms as were proffered at Utrecht. The electors of Cologne and Bavaria, who had been put under the ban of the empire, were restored; Sardinia, granted to Bavaria at U., was restored to Austria; Austria renounced her claims to the Spanish succession; the cession of the Spanish possessions in Italy was confirmed; Breisach and Freiburg, in the Breisgau, were also given to Austria; the highest ridge of the Maritime Alps was made the boundary between France and Savoy; and on failure of the Spanish Bourbons, the crown of Spain was to fall to the House of Savoy.—See Lord Mahon's "History of the War of Succession in Spain" (Lond. 1833).

UTRE'RA, an old town of Spain, in the province of Sevilla, and 18 miles by railway south-east of the city of that name. In early times, it was flourishing and populous; but fell into a state of stagnancy, from which it has begun to revive, along with the rest of Spain. It is important as a military post, contains a beautiful Gothic church, a Moorish castle, and cavalry barracks. The streets and promenades are kept clean and fresh by streams of running water. U. contains upwards of 18,000 inhabitants, mostly agriculturists engaged in the productive estates which surround the town. Corn, wine, oil, and fruit are produced. Sheep and cattle, as well as a breed of fierce bulls, are reared in the vicinity.

U'TRICLE is the botanical term for a kind of seed like the Achenium (q. v.). In the utricle, however, the pericarp does not lie close to the seed, but surrounds it as a loose inflated covering.

UTTERING COUNTERFEIT COIN is an offence punishable with one year's imprisonment with hard labor. The punishment is increased if, besides uttering, the person has other counterfeit coin in his possession. It is also an offence to utter false foreign coin as the Queen's coin or as foreign coin.

UTTO'XETER, a market-town of Staffordshire, on an eminence above the vale of the Dove, 16 miles north-east of Stafford. A church with an ancient tower and lofty spire is the only noteworthy building. There are two large breweries in the town, with a rapidly increasing business. Pop. (1871) 3804.

U'VULA. See PALATE.

U'XBRIDGE, a market-town in the county of Middlesex, on the Colne, 15 miles west of the city of London. Pop. (1871) 7407. Its corn-market is one of the most important in the kingdom.

V

V, the twenty-second letter in the English alphabet, is derived directly from the Lat. character *v*, which represented originally both the consonant *v* and the vowel *u* (see U). The name of the letter is derived from the Phœnician and Hebrew *vav* (signifying a nail, which the form of the letter originally resembled), which stood sixth in the alphabet, and became the Diganma (q. v.) of the Old Greek, and the *f* of the Latin (see F). The Greek *υ* (see ALPHABET), from which the Lat. *v* is taken, had, in the classical period, degenerated into a sound like the French *u*, and in modern Greek is undistinguishable from *i*. The Greeks, after they had lost the digamma, represented Lat. *v* by *ου* or *β*; e.g., *Ουαρρων* or *Βαρρων* = Varro, *Βιργιλιος* = Virgilius. In the beginning of Latin words, *v* must have had a consonantal sound approaching that of *v* in English, as is inferred from its persistence as compared with the Greek digamma; e.g., Vinum = (F)οινος Vesta = Έδρια. Between two vowels, on the contrary, it was often dropped out, as in *nuper* for *novumper*, *Jupiter* for *Jovipter*, *prudens* for *providens*; from which we may conclude that it had in that position the power of a semivowel, like Eng. *w*. In New High German, *v* takes the place of Gothic and Eng. *f* (see F), and is pronounced like *f*, while the *v*-sound is expressed by *u*.

VAAL RIVER, the Dutch name of one of the most important branches of the Gariep or Orange River, and signifying yellow, from the color of its waters when in flood, its Hottentot name, Ky Gariep, having really the same signification; the Bejjuans call it Namagari. It rises in the Mount of Sources, at the north-west angle of Natal, and running a very circuitous course of about 500 miles, forming the boundary between the Orange River Free State and the Transvaal Republic and Bejjuana tribes, it joins the other great branch, the Nu Gariep or Orange River, in lat. 28° 10' s., long. 24° 28' e.

VACATION, in Legal language, means the holiday usually enjoyed by lawyers in consequence of many of the courts being closed, and thereby some steps in a suit not being competent during part of the autumn of each year. There are short vacations during other parts of the year; but the long vacation is that which extends from 10th August to 24th October, and during that part of the year it is usual for legal business to be in great measure suspended.

VACCINATION is the process by which a specific disease, termed *vaccinia*, or cow-pox (from the Latin word *vacca*, a cow), is introduced into the human organism with the view of protecting it against an attack of an incomparably more severe disorder—viz., smallpox. For the history of this remarkable discovery of vaccination—"that master-piece of medical induction"—we must refer to the life of Jenner (q. v.). In his "Inquiry into the Causes and Effects of the Variolæ Vaccinæ," published 1798, he establishes the following facts: (1.) That this disease casually communicated to man has the power of rendering him un susceptible of smallpox; (2.) that the specific cow-pox alone, and not other eruptions affecting the cow, which might be confounded with it, had this protective power; (3.) that the cow-pox might be communicated at will from the cow to man by the hand of the surgeon, whenever the requisite opportunity existed; and (4.) that the cow-pox once ingrafted on the human subject, might be continued from individual to individual by successive

transmissible, conferring on each the same immunity from smallpox as was enjoyed by the one first infected direct from the cow.

The method of vaccinating and the *phenomena of cow-pox*, as observed in the human subject after vaccination, claim our first and chief attention. Except under circumstances of special risk (as, for instance, where smallpox is in the neighborhood), children should only be vaccinated when they are in apparently good health. Diarrhoea and skin-diseases are especially to be avoided; and it is important to see that there is no chafing behind the ears, or in the folds of the neck or groin. As more than one-fourth of the whole number of deaths from smallpox in England during the six consecutive years 1856-1861, took place in children of less than one year, it is obviously expedient that children should be vaccinated in very early infancy, provided health permits. Dr Seaton, in his comprehensive article on this subject in Reynold's "System of Medicine" (1866, vol. i. p. 459), observes that "plump and healthy children living in large towns should be vaccinated when a month or six weeks old; in more delicate children, the vaccination might be postponed till they are two or three months old; but all, except those whose state of health positively contra-indicates vaccination, should be vaccinated by the age of three months." This early age has also the advantage of being free from the irritation of teething.

The lymph to be used should always be taken from a healthy child, and from thoroughly characteristic vesicles; and when lymph in all respects satisfactory cannot be procured, as is often the case in country districts, the operation should be postponed. Lymph is usually taken when the vesicle is fully formed, which is usually about a week after vaccination; if it is not taken till the areola (which will be presently described) is complete, its protective power is far less certain. "Prime lymph," says Dr Seaton, "has always a certain degree of visciditv; and a thin serous lymph, even from a vesicle which is not advanced, is to be avoided. Babies are much better lymph-givers than elder children or adults; and children of dark complexion, not too florid, with a thick, smooth, clear skin, yield the finest and most effective lymph." Lymph should always, if practicable, be passed direct from arm to arm; and preserved lymph should only be had recourse to when a vaccinated child cannot be obtained. A good vesicle freely punctured on its surface exudes enough lymph or vaccine matter for the direct vaccination of five or six children, and for charging six or eight ivory points for future emergencies. The process of vaccination consists essentially in introducing the lymph into the structure of the true skin, or in bringing it in contact with the absorbing surface. This may be effected in various ways, one of the most common being by puncture. As the operation is extremely simple, and the knowledge of the mode of performing it may prove useful to many of our colonial readers, we shall briefly describe it. The skin on the outside of the arm, below the shoulder, should be held upon the stretch, and a very sharp, clean lancet, well charged with lymph, should be made to puncture the skin from above downwards, at an angle of about 45°, and be made just to enter the true skin. The matter thus inserted is retained by the valvular character of the puncture and the elasticity of the skin. In this form of the operation, not less than five or six such punctures should be made, at a distance of half an inch from the other; and for the sake of security, three punctures may be made on each arm. If the lymph is preserved on points, each point, after being held in the steam of hot water so as to dissolve the lymph, should be inserted into the punctures made by an ordinary lancet. Some surgeons make a number of minute superficial punctures over a patch of the size of a fourpenny-piece, and spread the lymph over this spot with the flat part of the lancet: this kind of tattooing should be repeated on three spots. Others make a number of parallel scratches, or crossed scratches, with a charged lancet; and others, again, use special scarifiers or rakes, consisting of three or four needle-points inserted in an ivory handle, and drawn either once or again at right angles over the tense skin, the lymph being then plastered over the scarified surface. Of these various plans, Dr Seaton believes that the best marks and most successful treatment result from this last plan of crossed scratches. A far better plan of preserving lymph than that of drying it on points, is that of preserving it in a fluid state in Husband's closed capillary tubes, in which form it is ready for use without any preparation. When the operation is successfully performed, the skin at the spot becomes slightly elevated, hard, and red, on the third or fourth day; on the fifth or sixth day, a vesicle of a

bluish-white color forms, which presents an elevated edge and a depressed cup. It is distended with clear lymph, and attains its perfection on the eighth day; and now, or on the ninth day, the vesicle is surrounded by an inflamed ring or areola; on the ninth, tenth, and eleventh days, the vesicle becomes a pustule, the cupped form disappears, the areola enlarges till it becomes a circle, with a diameter of from one to three lines. On the twelfth, thirteenth, and fourteenth days, the pustule dries up; and in the course of the next week, the scab separates and falls off: it seldom remains so long as the twenty-fifth day. It leaves a cicatrix, which commonly is permanent in after-life, circular, somewhat depressed, dotted or indented with minute pits, and in some instances radiated. The establishment of the areola is accompanied with constitutional disturbances, as indicated by restlessness and heat of skin, frequent derangement of the stomach and bowels, and occasional swelling of the glands of the armpit. These symptoms are seldom severe, but seldom quite absent. We occasionally meet with cases in which the course of the above symptoms is modified, as when they are simply retarded, or simply accelerated, or altogether irregular and spurious; and it should be carefully borne in mind that "a vaccination presenting any deviation from the perfect character of the vesicle and the regular development of the areola, is not to be relied on as protective against small-pox."—Seaton, "op cit." As a general rule, neither the local nor the constitutional symptoms of ordinary vaccination require any treatment.

From recent investigations, conducted by order of the government, and published in several of the "Reports of the Medical Officer of the Privy Council," it appears that amongst the poorer classes, vaccination is often so imperfectly performed as to leave no mark, and to exert no protective power. Mr Marson of the Smallpox Hospital believes that with good lymph, and the observance of all proper precautions, a good vaccinator should not fail of success in his attempts to vaccinate above one in 150 cases; while Dr Seaton puts one failure as a fair proportion in 170 cases.

The official inquiries above referred to, in the course of which the arms of nearly half a million vaccinated children were examined, prove, says Dr Seaton, who was employed in the investigation, the great extent to which imperfect or insufficient vaccination has obtained: taking the country throughout, not more than one child in eight was found to be so vaccinated as to have the highest degree of protection that vaccination is capable of affording; and not more than one in three could, on the most indulgent estimate, be considered as well protected. The main causes of this imperfect success were the following: "(1.) The frequency with which practitioners, instead of attempting fully to infect the system, had been satisfied with insertions of lymph sufficient to produce only one, two or three ordinary vesicles; (2.) the want of due attention to the selection of the lymph used in vaccinating; (3.) carelessness and clumsiness in the performance of the vaccination, so that, if the operation did not wholly fail, it very frequently resulted in a less degree of effect than it had been the aim of the operator to produce; and (4.) the great and unnecessary extent to which the use of preserved and conveyed lymph was substituted for vaccination direct from the arm."—Seaton "op. cit.," p. 508. The following observations made by Drs Buchanan and Seaton during the epidemic of smallpox in London, in 1863, on upwards of 50,000 children in various national and parochial schools, workhouses, &c., are of such extreme importance that we make no apology for inserting them. Some of the children had never been vaccinated; the large majority had been vaccinated in various manners and degrees. Of every 1000 children without any mark of vaccination, no fewer than 360 had scars of smallpox; while of every 1000 children who had evidence of vaccination, only 178, on an average, had any such traces: and with regard to the quality and amount of the vaccination, it was found that, of children having four or more cicatrices, only 0.62 per thousand had any trace of smallpox; while of those who had a single bad mark, 19 per thousand were scarred by smallpox. Hence the best vaccination was more than thirty times as protective as the worst, and the worst was more than forty-seven times better than none at all. The importance of the completeness of the vaccination, as shown by the cicatrices, is also well shown by the results obtained by Mr Marson. From the study of more than 15,000 cases at the Smallpox Hospital, he finds that while the unvaccinated died at the rate of 87 per cent., the vaccinated have died at the rate of only 6½ per cent.;

the mortality amongst those with four or more scars being only 0.55, while that amongst those with only a single scar was 7.78 per cent. ; so that, while the average risk which vaccinated persons run if they do catch smallpox is about one-sixth of the risk run by unvaccinated persons, well-vaccinated persons run less than one-seventieth part of the risk. It must further be borne in mind, that while few unvaccinated persons do not at some period of life sustain an attack of smallpox, the cases are comparatively rare in which a well-vaccinated person catches the disorder ; so that the protective power of vaccination shews itself in two ways—viz. (1), in shielding the constitution, in the great majority of cases, from any kind of an attack of smallpox ; and (2), in the exceptional cases, of so modifying the disease, as almost invariably to deprive it of danger to life, or of those terrible disfigurements which the unmodified disease so frequently leaves behind it.

With regard to the subject of *re-vaccination*, it has been amply demonstrated that its utility and necessity stand upon no speculative reasoning, but upon the broad basis of experience and observation. This operation should be performed with the same care and pains as primary vaccination, nor should it be left to periods when smallpox is epidemic, but should be performed on all persons after puberty, and this is the more necessary, for the primary operation is often very imperfectly performed. During an epidemic of smallpox, even young children, if the marks of the primary vaccination are at all imperfect, should most decidedly be re-vaccinated. In re-vaccinating it must always be remembered that "the local results of re-vaccination of any individual give us absolutely no information whatever as to the constitutional condition in which the re-vaccinated person was with regard to the liability to contract smallpox."

Much has been written regarding the *dangers of vaccination* ; and the well-known Rivalta case, in which an infant thus communicated syphilis to a whole population in a remote district of Piedmont (see *SYPHILIS*) ; and the death some years ago of a distinguished middle-aged baronet from (as it was alleged) vaccination with impure lymph, have directed special attention to the subject. For the discussion of this subject we must refer to Mr Simon's "Papers relative to the History and Practice of Vaccination ;" and we will only remark, that those who have had most to do with vaccination, and those who have had the most extensive experience in the diseases of children, concur in the belief of the non-communicability of disease by this operation.

The relations between smallpox in man and cowpox in the cow, claim a passing remark. Jenner believed that they were essentially the same disease, and that they had a common origin in the grease of the horse. Various experiments have been made to inoculate healthy cows with smallpox, and those of Mr Ceely of Aylesbury in 1839, and of Mr Badcock of Brighton in 1840, who induced vesicles by inoculating cows with smallpox virus, and thus obtained a supply of genuine vaccine lymph, place the identity of the diseases beyond all question. The disease really known as grease appears to have nothing to do with cow-pox or smallpox ; but the horse occasionally suffers an affection which is precisely the same as the smallpox in man and the cow-pox in cows ; and the lymph from this horse-pox has been successfully used for vaccination.

In conclusion, a brief paragraph must be devoted to the legal bearings of the question. In 1841, the Vaccination Act was passed, which made the practice of inoculating with smallpox virus unlawful. In 1853, another act, known as Lord Lytton's Vaccination Act, was passed, with the view of rendering the practice of vaccination compulsory, but this, though useful as far as it goes, proved a very imperfect measure. The Public Health Act, passed in 1858, gives to the Privy-council the power of appointing *public vaccinators* to give instruction in all practical points bearing on vaccination, for granting certificates of proficiency, and for the vaccination of poor persons residing in unions and parishes. They have, moreover, made arrangements for supplying lymph, guaranteed by the National Vaccine Board, to all medical practitioners who apply to "The Registrar of the National Vaccine Establishment, Privy-council Office, London, S.W." The Vaccination Act of 1867 was passed to "consolidate and amend the statutes relating to vaccination in England." By it the parent must have the child vaccinated within three calendar months from the child's birth, and the vaccination must be repeated until successful, unless the child be found insusceptible.

VACCINIA' CÆÆ, a natural order of exogenous plants, differing from *Eriaceæ* chiefly in having an inferior ovary and succulent fruit. Many botanists make it a section of *Eriaceæ*. About 900 species are known, natives of temperate climates, in all parts of the world, but chiefly in the northern hemisphere. A few species, remarkable as being parasitic, are natives of Peru. The *V.* are shrubs, and rarely small trees, with numerous round or angular branches, simple leaves on very short stalks, and flowers solitary or in racemes. Whortleberries (*q. v.*) and Cranberries (*q. v.*) are the most familiar examples of the order.

VĀCH (literally, speech) is another name of Saraswatī (*q. v.*), the female energy of the Hindu god Brahma.

VĀCHASPATI (literally, "lord of speech," from the Sanscrit *vāch*, speech, and *pati*, lord) is, in Hindu Mythology, one of the usual names of *Vṛishaspati* (*q. v.*), the instructor of the gods.

VACUUM literally means empty space, or space wholly devoid of matter. From Aristotle to Descartes, metaphysical speculators took the question into their own hands, and, of course, wrote nonsense about it. Thus, Descartes commits the absurdity of saying that, if a vessel be perfectly empty, its sides must be in contact—confounding the totally distinct ideas of *matter* and *space*. The dictum that *nature abhors a vacuum*, was employed to account for the rise of water in pumps; but it was presently found that nature did not abhor a vacuum through more than an elevation of about 33 feet. See **TORRICELLI**. When the subject was taken up by its legitimate owners, the experimental philosophers, such absurdities disappeared, but real difficulties were detected. So far as experiment has yet guided us, we may assert that vacuum cannot exist. The interstellar spaces, though probably devoid of ordinary ponderable matter, or at best only occasionally visited by it, are certainly pervaded by the luminiferous medium. See **ETHER**, **UNDULATORY THEORY**. That this is Matter (*q. v.*), is amply proved by the effects of its vibrations on the eye, and by the resistance which it has been discovered to oppose to the motion of Eucke's comet. It is not merely for the propagation of light and heat that we are forced to assume that the universe is a *plenum*; Newton expressly said (see **FORCE**, where the quotation is given at greater length) "That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance through a *vacuum*, without the mediation of anything else, by, and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it." Nothing could be stronger than this; and we have, in addition, the results of modern observation, which shew a connection between sun-spots, planetary configurations, and terrestrial magnetism, obviously requiring some material channel to exist between the sun and its secondaries. Faraday's electrical discoveries tend to the same conclusion.

But, in ordinary language, a vacuum is said to be produced (more or less *perfect*) when ordinary ponderable matter, such as air, is more or less completely removed from the interior of a closed vessel. Till the commencement of the present century, the most perfect vacuum that could be obtained was what is called the Torricellian vacuum—i. e., the space above the mercury in a carefully filled barometer tube. Such a vacuum, however, is almost useless for experimental purposes, and, besides, it contains mercurial vapor.

A suggestion of Davy's, recently re-invented and greatly improved by Andrews, gives the means of procuring a much more perfect vacuum than the Torricellian. An ordinary air-pump removes all but about the 1-120th of the gas in the receiver—i. e., produces a vacuum of about $\frac{1}{120}$ th inch, as it is called. But if the gas employed be carbonic acid, admitted and pumped out several times, so as to get rid, as far as possible, of the last trace of air, the remaining gas will be almost wholly taken up by means of moistened caustic potash previously placed in the receiver. Concentrated sulphuric acid should also be present, to desiccate the potash when it has done its work. In this way, Andrews easily obtained a vacuum of about 1-4500th of an inch, which remained unchanged for a fortnight. Here all but 1-135,000th of the air had been removed. Further improvements, devised by Frankland, Gasloott, and others, have been made in this process, especially for the production of (so-called) vacuum-tubes for the study of electrical discharges; and the exhaustion has been sometimes

carried so far that the attenuated matter remaining was unable to conduct the discharge of an induction-coll.

VA'GRANTS, or Tramps, a class of beggars, many thousands in number, who, having their headquarters in the large towns of England, wander about the country, subsisting upon charity and plunder. In England, the spirit of the laws and still more public opinion have always been averse to putting restraints upon the inclinations of even viciously disposed persons, and, consequently, the country has never been without a class of habitual vagrants—beggars and pilferers by profession. But there is reason to believe that the number of these social pests has, for many years past, been declining, absolutely, as well as relatively to population. The statute-book has long contained laws against vagrancy, but they have never been systematically executed. The severest of the early laws were directed against the gipsies—at one time a really formidable class of vagrants—and against wandering soldiers and marines, and persons pretending to be discharged soldiers and marines. Such vagrants were made liable to the punishment of felony. The vagrancy laws are now comprised in the acts 5 Geo. IV. c. 83, and 1 and 2 Vict. c. 83, supplemented to some extent by provisions contained in local police acts. Those statutes (using the descriptive phrases of previous enactments) made idle and disorderly persons—that is, persons able, in whole or in part, to maintain themselves and their families, and neglecting to do so—liable to one month's imprisonment and hard labor; rogues and vagabonds (habitual vagrants and persons suspected of living by crime), liable to three months' imprisonment and hard labor; and a third class, described as incorrigible rogues, liable to be committed for trial at the Sessions, to be kept to hard labor in the interim, and after conviction, to be sentenced to one year's imprisonment and hard labor, with whipping in the case of males. The police have authority to enter houses of reception for travellers, and to arrest persons suspected of falling under any of the above-named descriptions, and carry them before a magistrate for trial. But between the difficulty of finding satisfactory evidence of the character of persons thus found wandering, the commendable fear of making mistakes, the popular feeling that vagrancy is not a crime, and the unwillingness of magistrates to add to the expense of prison establishments, the statutory powers have never been used to such an extent as to affect the prevalence of vagrancy.

On the other hand, a direct and material support has been given to vagrancy by the arrangements which, under the new poor-law, now exist in most districts for the relief of the travelling poor. In almost every union workhouse in England there is a casual ward, intended for poor artisans and laborers making their way, as they sometimes have to do, from places where work is slack to places where it is plentiful. The casual ward has been taken possession of by the vagrant, for whom the law provides only a prison-cell. From two-thirds to three-fourths of its occupants are usually habitual vagrants. Here the vagrant gets his supper, his bed, and in most cases his breakfast. The fare is exceedingly meagre—a little bread, with occasionally a bit of cheese, or a small quantity of skilley (gruel); and the sleeping accommodation is usually worse than that of the lowest lodging-houses—cleanliness being impossible with such occupants, and there being no desire to give them comfort. But the vagrant gets supplies of food in his wanderings by begging and plundering; and he seeks the casual ward chiefly for the shelter and the society. In 1848, Mr Charles Buller, then President of the Poor-law Board, prescribed a set of rules, which for a time almost deprived the vagrant of this resource. Relief was to be refused to all able-bodied young men unless they produced passes or certificates declaring their character from a clergyman or some person in a public position, or unless the workhouse officials were satisfied they were actually destitute; orders for the casual ward were to be given only by the police—whom the tramp regards as his natural enemies; and a suitable task of work was to be exacted from every person relieved. But these rules were soon withdrawn. In a good many cases, the police are still employed to give away the orders, and on the whole with advantage; but passes (this was the really valuable regulation) are not required; and in not a few cases, no task of work is exacted, because the poor-law guardians found that they lost money upon the work done by vagrants. In other cases, an option is given to the tramp of doing a certain amount of work, or going away in the morning without his breakfast. He almost always prefers the latter alternative. But, in general,

about three hours' work is imposed; and when the workhouse authorities insist upon it, the vagrants usually—though greatly disliking work—comply with this condition.

By far the greatest number of the vagrants are men between the ages of 20 and 40, the average age being about 34. There is a small proportion of men above 40, and about an equal number of youths under 20—mostly runaway apprentices. About a fourth or a fifth are women, who are generally travelling with male vagrants; but the life seems to be too hard for women. The men often pretend to be going about in search of work, but seldom or never do work; and the majority of the vagrants are of the class who, from mental constitution, would almost die rather than work. They are, besides, it must be added, persons whom decent laborers would not allow to be associated with them. Many of them have been brought up in workhouses; others are deserters from the army, or discharged soldiers of bad character; not a few are dissipated broken-down workmen, who, while tramping about in search of work, have acquired the tramp's bad habits and love of idleness. Many of them have been brought up to crime, but want the skill and daring necessary to success in their profession. They often make some pretence of occupation, under cover of which they approach houses to beg, or steal, or bully unprotected women. They are vendors of steel-pens, paper, laces; tinkers, chin-menders, umbrella-repairers, ballad-singers. They are much given to small thefts; most of them are believed to be capable of any crime; but in fact they attempt few serious crimes. They are poor timid creatures, and feel that society with its police is too strong for them. They never unite together to commit crimes, but occasionally 20 or 30 of them, operating in twos and threes, work a district in concert. There is a free-masonry among them; and any new rule adopted at a workhouse becomes known in two or three days over a wide district. They are usually known by slang names; their language is horribly blasphemous and obscene; and neither men nor women have the smallest regard for decency, or any conception of sexual restraints. They give a great deal of trouble at the workhouses—swearing at and threatening the officials, occasionally stabbing them, refusing to do the allotted work, and not unfrequently tearing up their clothes, in the hope that the officials, out of regard to decency, will supply them with others. The officials can only threaten them with the magistrate and the jail; but sometimes—and it is then they are most insolent and troublesome—they have a desire for rest and regular feeding, and are not unwilling to go to jail. It is hard to understand what are the enjoyments of their wandering and shifty life. Apparently, the freedom of it and the immunity from work are its chief attractions. They have been well described as wandering about "ready for any crime, but not planning crimes, quite ready to rob, but very much afraid of large dogs, very courageous against unprotected women, but skulkers when a broad-shouldered laborer turns his eyes their way, with no purpose except wandering, no restraint except hunger, no hope except of getting drunk upon some lucky haul, nomads in the midst of civilisation, simple savages without savage resources." The revival of the regulations prescribed by Mr Bulter, and the steady enforcement of the vagrancy laws—which should also be made more severe—are the measures most likely to put down vagrancy. There is no offence against society for which penal servitude would be a more appropriate penalty.

VAIR. See HERALDRY.

VAISĒSHIKA is the name of one of the two great divisions of the *Nyāya* (q.v.) school of Hindu philosophy, and probably a later development of the *Nyāya* itself, properly so called, with which it agrees in its analytical method of treating the subjects of human research, but from which it differs in the arrangement of its topics, and more especially by its doctrine of atomic individualities or *visēshas*—whence its name is derived.

The topics or categories (*paddārthas*) under which *Kan'āda*, the founder of this system, arranges his subject-matter, are the following six: (1) substance, (2) quality, (3) action, (4) generality, (5) atomic individuality, and (6) co-inherence; and later writers of his school add to these a seventh category, *viz.*, non-existence. 1. Substance is the intimate cause of an aggregate effect; it is that in which qualities abide, and in which action takes place. It is ninefold, *viz.*, earth, water, light, air, ether, time, space, soul, and *manas*, or the organ of affection. 2. Quality is united

with substance; it comprises the following 24: color, savor, odor, feel, number, dimension, severality, conjunction, disjunction, priority, posteriority, gravity, fluidity, viscosity, sound, understanding, pleasure, pain, desire, aversion, volition or effort, merit, demerit, and self-restitution. 3. Action consists in motion, and abides in substance alone. It affects a single, that is, a finite substance, which is matter. Action is either motion upwards or motion downwards, or contraction or expansion, or motion onwards. 4. Generality abides in substance, quality, and action. It is of two kinds, higher and lower—genus and species. 5. Atomic individuality resides in eternal substances, by which are meant the organ of affection, soul, time, space, ether, earth, water, light, and air; it is the ultimate difference, technically called *vis'eṣa*; such differences are endless; and two atoms of the same substance, though homogeneous with one another, differ merely in so far as they exclude one another. 6. Co-inference, or perpetual intimate connection, resides in things which cannot exist independently from one another, such as the parts and the whole, quality and the thing qualified, action and agent, species and individual, atomic individuality and eternal substance. 7. Non-existence, the last category, added to the foregoing by the modern Vaiś'eṣika, is defined by them as being either non-existence, which is without beginning, but has an end—as that of a jar, which did not exist until its antecedent non-existence ceased when being formed out of the clay; or non-existence, which has a beginning, but no end—as that of a jar which is smashed by the blow of a mallet; or absolute non-existence, which, extending through all times, has neither beginning nor end—as when it is said that a jar is not on the ground; or mutual non-existence, which is the reciprocal negation of identity—as when it is remarked that a jar is not a piece of cloth. The nature of each of these substances, qualities, actions, &c. is, then, the subject of special investigation. Thus, *earth* is said to be that of which the distinguishing quality is odor; it is described as being of two kinds: eternal, in its atomic character; and uneternal, when in the shape of some product. Again, products are defined as either organised bodies of five sorts, or organs of perception, or unorganic masses, such as stones, &c. Amongst the qualities, color is defined as that quality which is apprehended only by the sense of sight; which resides in earth, water, and light; which is distinguishable in earth as white, yellow, green, red, black, tawny, and variegated; in water, as white, but not resplendent; in light, as white and resplendent, &c. *Self-restitution*—to give another instance of the definition of the qualities—is described as threefold: as impetus, the cause of activity in earth, water, light, air, and the organ of affection; as the mental process peculiar to the soul, which is the cause of memory; and as elasticity, in mats and similar substances, which causes an altered thing to reassume its former position.

Though this cursory statement must here suffice to give a general idea of the Vaiś'eṣika system, it is worthy of especial notice that, according to it, understanding is the quality of *soul*, and the instruments of right notion are treated of under the head of "understanding (*buddhi*).¹" Kau'āda admits of only two such instruments, or *pramāṇ'as*, viz., knowledge which arises from the contact of a sense with its object, and inference. Comparison, revelation, and the other instruments of right notion, mentioned in other systems, the commentators endeavor to shew are included in these two. Fallacies and other modes of inconclusive reasoning are further dealt with in connection with "inference," though with less detail than in the Nyāya, where these topics are enlarged upon with particular predilection.—The reputed founder of the V. is *Kau'āda*, which name the native authorities derive from *Kan'a*, minute, and *āda*, eating, and sometimes, therefore, also change into *Kan'abhuṣ* or *Kan'abhakṣa* (*bhuṣ* and *bhākṣa* being synonyms of *āda*). Nothing, however, is known as to the history or date of this personage, as they are involved in the same obscurity which covers most of the renowned writers of ancient India. His work is divided into ten *qāhyas*, or books, each of which is subdivided into two diurnal lessons; these, again, being subdivided into sections containing two or more "Sūtras" (q. v.), or aphorisms, on the same topic. Like the Nyāya-Sūtras, the work of *Kau'āda* has been commented upon by a triple set of commentaries, and popularised in several elementary treatises. The text with the commentary of "Sankara Miśra"—who is not to be confounded with the celebrated Vedānta author—has been edited at Calcutta in 1861 by the Pau'dit Jayanārāyaṇa Turka Pañchānaṣa, who added to it a gloss of his own; and of the Sūtras have been translated by the late Dr Ballantyne

(Mirzapore, 1851). Of later works on the same system, may be mentioned the "Bhāṣāparichcheda," edited, with the commentary called "Siddhāntamuktāvatī," and translated by the late Dr Roer in the "Bibliotheca Indica" (Calcutta, 1850), and the popular "Tarkasaṅgraha" in several editions; edited also and translated by Dr Ballantyne (2d edit., Calcutta, 1848), who in his preface gives a catalogue of the commentaries, which this work has elicited. The reader not acquainted with Sanscrit is, for further information on the subject, referred to these translations, and to the essay on the V. system by H. T. Colebrooke ("Miscellaneous Essays," vol. 1., Lond. 1837), and Professor M. Müller, in the 6th and 7th volumes of the "Zeitschrift der deutschen morgenländischen Gesellschaft."

VAISHNĀVAS is the name of one of the three great divisions of Hindu sects. See INDIA, section Religion. The word, derived from Viṣṇu's (q. v.), designates the worshippers of this deity, and comprises a great variety of sects; but this variety itself differs according to different periods of the medieval history of India, old divisions becoming extinct, and new ones taking their place. Thus, the account of the V., as given in a celebrated work of "Anandagiri," the "Sankara-digvijaya," or the victory of the great theologian Śaṅkara over his religious adversaries, would no longer apply in detail to the present condition of the V.; and even some of those varieties mentioned by the late Professor Wilson in his "Sketch of the Religious Sects of the Hindus," written in 1833, would seem to have disappeared already in our days. The common link of all the sects comprised under the name of V., is their belief in the supremacy of Viṣṇu over the other gods of the Trimūrti (q. v.). Their difference consists in the character which they assign to this supremacy, and to the god Viṣṇu himself, in the religious and other practices founded on the nature of their belief, and in their sectarian marks. The following sects belonging to this category may especially be noticed here.

1. The Rāmānujas, or Śrī Vaiṣṇāvas, or Śrī-Sampradāyins. They derive their origin from Rāmānuja, a celebrated reformer, who was born at Perumbur, in the south of India, about the middle of the 12th c., and is considered by his followers as an incarnation of Śeṣha (q. v.), the serpent of Viṣṇu. He studied at Conjevaram, resided afterwards at Śrīraṅga, and then travelled over different parts of India, where he was especially engaged in combating the professors of different creeds, particularly the Śaivas. On his return to Śrīraṅga, he was seized by the king Keriṅka's Chola, but effected his escape, and found refuge with the Jain king of Mysore, Viṭṭala Deva, whom he converted to the Vaiṣṇava faith. For twelve years he then remained at Mysore; but at the death of the Chola king, returned to Śrīraṅga, where he spent the remainder of his life in religious seclusion. The Rāmānujas address their worship to Viṣṇu and his consort, Lakṣmī (q. v.), and their respective incarnations, either singly or conjointly. Hence their sect consists of corresponding subdivisions, according as Nārāyaṇa or Lakṣmī, or Lakṣmī-Nārāyaṇa, or Rāma, or Śītā or Śītā-Rāma, or any other incarnation of these deities, is the preferential object of the veneration of the votary. Their most striking peculiarity is the preparation and the scrupulous privacy of their meals; for should the meal during its preparation, or while they are eating, attract even the looks of a stranger, the operation is instantly stopped, and the viands buried in the ground. The marks by which they distinguish themselves from other sects are two perpendicular white lines, drawn with a white earth. *Gopichandana*, from the root of the hair to the commencement of each eyebrow, and a transverse streak connecting them across the root of the nose; in the centre is a perpendicular streak of red, made with red sanders, or a preparation of turmeric and lime; other marks, representing several of the attributes of Viṣṇu, they have either painted or impressed on the breast and each upper arm; and, besides, they wear a necklace of the wood of the Tulasi (holy basil), and carry a rosary of the seeds of the same plant, or of the lotus. The sacred formula with which a member of this sect is initiated into it consists merely of the words *Om rāmāya namaḥ*, "Om, salutation to Rāma." Their principal religious tenet is the belief that Viṣṇu is the cause and creator of all worlds; that he and the universe are one, though he is of a twofold form: the supreme spirit or cause, and the gross one, the effect or matter. In distinction from the Vedānta, with which their doctrine has otherwise many points of contact, they regard their supreme deity as endowed with qualities, all of which are of course excellent; and teach that the universe consists of

chit, thinking or spirit, *acāit*, unthinking or matter, and *īśvara*, or god; the relation of which is that of enjoyer, the thing enjoyed, and the ruler of both. The deity, they assume, is or has been visibly present in five modifications: in the objects of worship, as images, &c.; in the incarnations (see under VIṢṆU); in certain forms called Vyūhas, viz., Vāsudeva or Kṛish'na; Balarāma, Pradyumna, and Aniruddha; and in the subtle form which comprises six qualities—absence of passion, immortality, exemption from pain or care, absence of natural wants, love, and practice of truth—and the human soul; all of which have to be worshipped serially, as the votary ascends in the scale of perfection. The chief authoritative works in Sanscrit of this sect are the "Vedānta Sūtras," with several commentaries; several works on the Vedānta (q. v.) philosophy, the "Pancharātra" of Nārada; of Purāṇas (q. v.), the "Viṣṇu's," "Nāradya," "Garud'a," "Padma," "Varāha," and "Bhāgavata-Purāṇa;" and besides, the works of "Venka'ta," and several popular works in the dialects of the south. It is in the south that the followers of Rāmānuja, and their temples and establishments, are still numerous; in the north of India, where they are better known as *Srī Vaiṣṇavas*, they are not of frequent occurrence.

2. The *Rāmānandas*, or *Rāmīvats*. They are by far the most numerous class of sectaries in Gangetic India: in the district of Agra, they alone constitute seventieths of the ascetic population. They belong chiefly to the poorer and inferior classes, with the exception of the Rājputs and military Brahmans. The founder of this sect was *Rāmānanda*, who, by some, is considered to have been the immediate disciple of Rāmānuja; by others, the fifth in descent from that teacher, when he would have lived about the end of the 13th c.; but other more reliable accounts place him toward the end of the 14th, or the beginning of the 15th century. According to common tradition, Rāmānanda seceded from the Rāmānujas, to whom he originally belonged, because, having spent some time in travelling through various parts of India, and, in consequence, having been suspected by his fellow-disciples not to have conformed to the rule of the Rāmānujas in taking his meals, he was condemned to feed in a place apart from the rest of them, but did not acquiesce in the affront thus offered him. His residence was at Buaras, at the Pancha Ganga Ghāt, where a *Math*, or monastery, of his followers is said to have existed. The especial object of their worship is Viṣṇu, in his incarnation as *Rāmachandra*, and his consort *Sītā*, and, as amongst the Rāmānujas, these deities either singly or jointly. Some members of this sect also pay adoration to other forms of Viṣṇu; and the religious mendicants of the sect consider all form of adoration superfluous, being content with the incessant invocation of Kṛishṇa and Rāma. Their practices are less precise than those of the Rāmānujas; but the most important difference between them consists in the fact, that Rāmānanda abolished the distinction of caste amongst the religious orders, and taught that a *Vairāgia*, or one who quitted the ties of nature and society, shook off at the same time all personal distinction. The initiatory formula of a Rāmānanda is *Srī Rāma*, or "blessed Rāma." Their sectarian marks are the same as those of the Rāmānujas; except that the red perpendicular streak on the forehead is varied in shape and extent, and generally narrower than that of the Rāmānujas. There are various sub-divisions of this sect, believed to have been founded by several eminent disciples of Rāmānanda. Their doctrines vary often from that of the latter, but they maintain an amicable intercourse with the Rāmānujas and with each other. The twelve chief disciples of Rāmānanda were *Aśānand*, *Kabir*, *Ridāis*, *Pipī*, *Sursurānand*, *Sukhānand*, *Bhāvānand*, *Dhyanānand*, *Sena*, *Mahānand*, *Paramānand*, and *Srī Anand*; and besides these *Nābhājī*, the author of the *Bhaktamālā*, *Sār-Dās*, *Tulast-Dās*, the translator in Hindi of the *Rāmāyaṇa*, and the author of many popular works which exercise a considerable influence on the Hindu population, and the poet *Jayadeva*, the author of the *Gītāgovinda*. Many legends, of course, are related of these personages, especially in the *Bhaktamālā*, the favorite work of this sect.

3. The *Kabir Panthis*. The founder of this sect, one of the most interesting and important in Upper and Central India, except, perhaps, in Bengal itself, was Kabir, the most celebrated of the twelve disciples of Rāmānanda, before mentioned, who, therefore, probably lived about the end of the 14th century. The circumstances connected with his birth, life, and death are all related as miraculous; and so little is certain about his life, that even the Mussulmans claim him as one of their persuasion. But his great conversancy with the Hindu *Sāstras*, and his limited knowledge

of the Mohammedan authorities, render such a supposition highly improbable. According to the doctrine of this sect, there is but one God, the creator of the world; but, in opposition to the Vedānta (q. v.), they assert that he has a body formed of the five elements of matter, and a mind endowed with the three *guṇas*, or qualities. He is of ineffable purity and irresistible power, eternal, and free from the defects of human nature, but in other respects does not differ from man. The pure man in his living resemblance; and after death, becomes his equal and associate. God and man are therefore not only the same, but both in the same manner everything that exists. For 72 ages, God was alone; he then felt the desire to renew the world, which desire assumed the shape of a female form; and this form is *Māyā* (q. v.), or illusion, with whom he begot the triad, Brahma, Viṣṇu, and Śiva. He then disappeared, and *Māyā* approached her offspring, in order to frame the universe. Viṣṇu hesitated to associate with her, and is therefore more respected by the Kabīr Panthis than the other two gods of the triad; but the latter were frightened by her, and the result of their submission was the birth of Sarasvatī, Lakṣmī, and Umā, whom she wedded to the three deities to produce the world. To understand the falsehood of *Māyā* is, therefore, the chief aim of man; and so long only as he is ignorant of the source of life, he is doomed to transmigration (q. v.), which, according to the belief of this sect, is also extended to the planetary bodies—a falling star or meteor being a proof, for instance, that it undergoes a fresh change. The moral code of the Kabīr Panthis is, in many respects, creditable to them. Life, they teach, being the gift of God, must not be violated by his creatures. Humanity and truth are two of their cardinal virtues; retirement from the world is deemed desirable; and implicit devotion, in word, act, and thought, to the Gurn, or spiritual teacher, a supreme duty. But, as regards the latter point, it is characteristic that the pupil is enjoined first to scrutinize the teacher's doctrine and acts, and to be satisfied that he is the sage he pretends to be, before he resigns himself to his control. It is no part of their faith to worship any deity, or to observe any ceremonies and rites of the Hindus; but they are recommended outwardly to conform to all the usages of tribe and caste, and some even pretend to worship the usual divinities, though this is not considered justifiable. They have no peculiar mode of dress, and though some wear the sectarian marks of the V., and the necklace and rosary, all these outward signs are considered of no importance. Though, therefore, properly speaking, they can scarcely be included amongst the Vaiṣṇava sects, yet their paying more respect to Viṣṇu than to any other god of the Trīṃūrti (q. v.), and the fact of Kabīr having been a disciple of Rāmānanda, also the friendly intercourse which they maintain with most of the Vaiṣṇava sects, cause them always to be looked upon as belonging to them. The doctrines of Kabīr are taught in a great variety of works in different dialects of Hindi, all of which are the acknowledged compositions of his disciples and successors. The principal are the *Sākhīs*, 6000 in number, consisting of one stanza each; the *Bijak*, in 664 sections; and the *Sukh Nidhān*. The sect itself is split into a number of subdivisions, and twelve branches of it are traced to the following personages: *Śrūtgoṇḍī Dās*, the author of the *Sukh Nidhān*—his successors preside over the Chaura at Benares; *Bhago Dās*, the author of the *Bijak*; *Nārāyaṇ Dās* and *Churāmān Dās*, the two sons of a merchant at Jabbalpur; *Jaggo Dās*, of Kuttack; *Jivan Dās*; *Kamālī*, of Bombay; *Tāk Sāhī*, of Baroda; *Juānī*, of Majhiul, near Sahāsrām; *Sāheb Dās*, of Cuttack; *Nityānand*, and *Kamāl Nān*, in the Dekhan. The principal establishment of the sect is the Kabīr Chaura at Benares.

4. The *Vallabhachāryas* or *Rudra Sampradāyins*. The original teacher of this sect is said to have been Viṣṇu's *Svāmī*; but it is a later successor of his, *Vallabha Svāmī*, or *Vallabha Achārya*, who, from the influence which his teaching and writing exercised on the propagation of his doctrines, must be considered the real founder of this sect. He was born in 1479, in a forest called Champāraṇya, where his parents deserted him on a pilgrimage they had undertaken to Benares. The gods, of course, took care of the infant; and his parents, who recovered him afterwards, took him to Gokula, a village on the left bank of the Jumna, a short distance from Mathura, where he received his first education. In his twelfth year, he left this place, in order to propagate throughout India his tenets, which at that time, it must be understood, he had already framed. On arriving at a certain town in the south of India, he became acquainted with a person of influence, *Damodarāś*, whom he converted to his doctrine. Both of them then proceeded together to the

city of Vijayanagar, where the maternal parents of Vallabha resided. He was now introduced to the court of the king of Vijayanagara, Kriṣṇa'adeva, and succeeded so well in his disputation with the Śaivas and Smārta Brāhmanas, that not only the king bestowed on him rich presents, but the Vaiṣṇava's elected him as their chief, which the title of Achārya, or spiritual teacher. He then travelled to Ujain, Allahabad, and Benares, and from there, for nine years, through different parts of India, until, on his return to Brindāvan, as a reward for his exertions and faith, he was honored by a visit from the god *Kṛiṣṇa* in person, who enjoined him to introduce his worship, and to found the religion now so widely diffused throughout Western India under the sectarian name of *Rudra Sampradāya*. Vallabha ultimately settled at Benares, and there composed 17 works in Sanscrit, the most important of which are a commentary on the Vedānta (q. v.) and *Mīmāṃsā* (q. v.) Sūtras, and one on the *Bhāgavata Purāṇa*; works, however, only intended for the learned, and now very rare. He died on a hill in the vicinity of Benares, in his 52d year, after having made 84 devoted disciples. He was succeeded by his second son, *Vithalnāthji*, who was born in 1516, in the village of Parnār, and is known amongst the sect by the designation of *S'ri Gosālu Ji*, his father Vallabha's sectarian name being *S'ri Achārya Ji*. *Vithalnāthji* died in 1588, and left, besides four daughters, seven sons, who were all teachers, and formed as many communities; viz., *Gīrdharji* (born 1540), *Govinda Rāy* (born 1542), *Bālkrīṣṇaji* (born 1549), *Gokulnāthji* (born 1551), *Ragunāthji* (born 1554), *Jadunāthji* (born 1556), and *Ghanashyamji* (born 1561). It was, however, *Gokulnāthji* who became the most celebrated of the descendants of *Vithalnāthji*, for to him especially is due the vitality of this sect; and even to the present day the followers of his descendants consider their own Gosāins the only legitimate teachers of their faith, while even the adherents of the other sons of *Vithalnāthji* pay them the greatest respect. It is about the period when the sons of *Vithalnāthji* dispersed that they first acquired the title of *Mahārāji*, or "great king," by which the chiefs of this sect are now best known, though besides this proud designation they have other distinctive titles, such as *Vallabha Kula*, *Agni Kula*, *Guru*, &c. The heads of the *Gokulnāthji* division of this sect are usually called *Gokul Gosāins*, or *Gokulastha Gosāins*. The members of this sect are widely diffused throughout Bombay, Catch, Kattywar, and Central India, and especially the province of Malwa. Their establishments and temples are numerous throughout India; especially at Mathura, Brindāvan, and Benares. The most celebrated of all is at *S'ri Nāth Dwar*, in Ajmeer; and the members themselves belong to the better and wealthier classes of the Hindu community. At present, there are about 60 or 70 "Mahārājas" of this sect dispersed over India; eight or ten of whom reside at Bombay alone, and fifteen or sixteen at Gokul. But so much degenerated are they as a body, that only two or three of them have any knowledge of Sanscrit; the rest, as a distinguished writer on this sect, Mr Karsandas Mulji, asserts, being grossly ignorant; for, as Wilson remarks, it is a curious feature in the notions of this sect, that the veneration in which the Gosāins are held is paid solely to their descent, and unconnected with any idea of their sanctity and learning; and that, though they are not unfrequently destitute of all pretensions to individual respectability, they nevertheless enjoy the unlimited homage of their followers.

The chief authority of the sect is the "*Bhāgavata Purāṇa*" (q. v.), and after it, the works of Vallabha and various books, 74 in number, 59 of which are translations from Sanscrit, and the rest original compositions in the Brijbhāshā dialect. The object of their adoration is *Viṣṇu* (q. v.) in his incarnation as *Kṛiṣṇa*, whose residence is Goloka, far above the three worlds. There he originally lived alone, but in meditating on the works of creation, created a female form, which became the primary agent in creation and was *Māyā*. He then produced crude matter, the five elements, and all the divine beings; the gods of the Trimūrti, their female consorts, and 800 millions of Gopis, or cowherdesses, who are the especial attendants on *Kṛiṣṇa*. The principles of the sect, as laid down by Vallabha, are the following ten—1. To secure the firm support of Vallabhāchārya; 2. To exercise chiefly the worship of *Kṛiṣṇa*; 3. To forsake the sense of Vaidik opinion, and be a suppliant to *Kṛiṣṇa*; 4. To sing praises with feelings of humility; 5. To believe that Vallabha is a Gopi, or mistress of *Kṛiṣṇa*; 6. To swell the heart with the name of *Kṛiṣṇa*; 7. To forsake his commands not for a moment; 8. To put faith in his

words and doings; 9. To adopt the society of the good, knowing them divine; and 10. To see not the faults, but speak the truth. Out of this code, however, grew up the doctrine, that the Guru or Mahārāj is the impersonation of Kṛishṇa himself, that God and the Guru are necessarily to be worshipped, and that the sectary is bound to bestow on him "his body, organs of sense, life, heart, and other faculties, and wife, house, family, property, with his own self." The gross abuse which was made of this tenet became apparent in a very remarkable trial, the so-called Mahārāj Libel Case, which took place in 1861 in the Supreme Court of Bombay, and revealed the licentiousness of one of the then Mahārājas of the sect of Bombay; the defendant sued for libel by this Mahārāj being a highly respected and distinguished member of the sect, Mr Karsandās Mulji, who had had the courage of calling, in a native newspaper, on the Mahārājas to reform, and to return to the ancient Hindu faith, and whose public conduct on that occasion elicited the highest praise of the court, and, it is to be hoped, initiated a better era of this sect. The temples of the sect have images of Kṛishṇa, and Rādhā, his principal wife; the former representing a chubby boy, of a dark hue, who is richly decorated, and eight times a day receives the homage of his worshippers. The ceremonials which on those occasions take place are the *mangala*, or morning levee, about half an hour after sunrise, when the image is washed and dressed, and presented with refreshments; the *s'ringāra*, when the image, having been anointed and perfumed, holds his public court—this takes place about an hour and a half after the preceding; the *gudā*, 48 minutes after the last, the image being now visited preparatory to its going out; the *rājābhoga*, held at mid-day, when Kṛishṇa is supposed to have come home from the pastures and sat down to dine—all sorts of delicacies are then placed before the image, and distributed to the votaries present; the *utthāpana*, three hours before sunset, when the god is summoned to get up from his siesta; the *bhoga*, or afternoon meal, about half an hour later; the *sandhyā*, about sunset, or the evening toilet of the image; and the *s'ayana*, or retiring to repose, about seven in the evening; the image then being put upon a bed, and refreshments being placed near it, when the votaries retire, and the temple is shut till the ensuing morning. Besides these ceremonies, there are other annual festivals observed by this sect throughout India; of these, the *Rath Yātra*, or procession of the god in a chair, is the most celebrated in Bengal and Orissa; the most popular at Benares is the *Jannāshaktant*, or the nativity of Kṛishṇa; and the *Rās Yātra*, or annual commemoration of the dance of Kṛishṇa with 16 Gopis—a very popular festival, at which all kind of rejoicings take place. The mark on the forehead of the Vallabhāchāryas consists of two perpendicular lines meeting in a semicircle at the root of the nose, and having a round spot of red between them. On the breasts and arms, they have the same marks as the Rāmānujās, made with a black earth called *S'yāmabandī*, or any black metallic substance; their necklace and rosary are made of the stalk of the Tulasi (holy basil) plant.—For a fuller account of this sect, its authorities, festivals, and worship, and the practices of the Mahārājas, see the interesting "History of the Sect of Mahārājas or Vallabhāchāryas in Western India" (by Karsandās Mulji—London, 1865), which also contains the history of the "Mahārāj Libel Case" above referred to.

5. The *Mādhvāchāryas* or *Brahma Sampradāyins*. This sect occurs especially in the peninsula, and was founded by a Brahman, *Mādhvāchārya*, who is looked upon by his followers as an incarnation of Vāyu, the god of wind, after having been incarnate in preceding ages as Hānumat (q. v.) and Bhīma. He was born in the year 1199, and educated in a convent at Ananties war. In his ninth year, he was initiated into the order of Anchorites by Achyuta Pracha, a descendant of Sanaka, a son of Brahman. At that early age he composed a commentary on the Glā; then travelled to the Himālaya, and when returned, erected at Udipi the image of Kṛishṇa, which had been originally made by Arjuna, and miraculously recovered by him. In addition to the principal temple at Udipi, he established eight other temples in Tulva, below the Glā; composed, it is related, 87 works, and on a controversial tour, triumphed over various divines. In his 79th year he went to Badarikāśrama, where, the legend says, he continues to reside with Vyāsa, the compiler of the Vedas and Purāṇas. It seems that he was originally a priest of the S'āiva faith, and one of his names, *Ananda Tīrtha*, even indicates that he belonged to the class of Dis'nami Gōṣāins, who were instituted by *S'ankarāchārya* (q. v.). He encouraged, therefore, an attempt to form a kind of compromise between the S'āivas and Vaish-

n'avas; and in the temples of his sect, images of Ś'iva are allowed to partake of the worship offered to those of Viṣṇu'a. Votaries of the Mādhva Gurus and of Ś'aṅkarāchārya Gosāins offer also the reverential obeisance to their teachers mutually, and the latter visit the temple of the former to perform their adoration at the shrine of Kṛ'ṣṇu'a. The essential dogma of this sect is the identification of Viṣṇu'a with the Supreme Soul, as the pre-existent cause of the universe; and this primeval Viṣṇu'a they affirm to be endowed with real attributes, and although indefinable, to be most excellent and independent. But this besides independent, there is also a dependent, principle; for besides the supreme soul, *Paramātmān*, there is a living soul, *Jīvatmān*, which is dependent on the Supreme; and though indissolubly connected with, yet not the same with him. In consequence, they deny the absorption of the human soul into the universal spirit, and the loss of independent existence after death. In this respect, they differ, therefore, on a vital point of doctrine, from the members of other Vaiṣṇava and Śaiva sects. The manner in which they conceive the universe to have issued from the Supreme Being, is to a great extent analogous to that of the other Vaiṣṇavas; and they also receive the legends of the Vaiṣṇava Purāṇas relating to the birth of Brahmaṇ, from the lotus, which grew out of the navel of Viṣṇu'a, &c. The modes of worshipping Viṣṇu'a they declare to be three: marking the body with his symbols, especially by means of a hot iron; giving his names to children and objects of interest; and the practice of virtue in word, act, and thought. That in word consists in telling the truth, giving good counsel, mild speaking, and study; that in act comprises liberality, kindness, and protection; and clemency, freedom from envy, and faith, are the practice of virtue in thought. Final liberation, or freedom from future birth, they consider as the reward for having secured the favor of Viṣṇu'a by sedulously worshipping him; and those who have attained it, enjoy felicity in Viṣṇu'a's heaven, under one or all of the four conditions: of being similar to him in form, of remaining in his visible presence or in his proximity, and of sharing equal power with him.

Their worship is not materially different from that of the other V., except in one peculiarity, which proves that they have a friendly leaning towards the Śaiva sect; for the images of Ś'iva, Durgā, and Gaṇeś'a are placed by them in the same shrine as Viṣṇu'a. The Gurus, or superiors, of this sect are Brahmaṇs and ascetics, or profess cosmobitic observances; the disciples live in their *Maths*, or monasteries, and profess also perpetual celibacy. The lay votaries of these teachers are members of every class of society except the lowest. The Gurus adopt the external appearance of ascetics, laying aside the Brahminical cord, carrying a staff and water-pot, going bareheaded, and wearing a single wrapper of an orange color. The marks common to them and the lay votaries are the symbols of Viṣṇu'a upon shoulders and breast, and the frontal mark, consisting of two perpendicular lines made with the white clay of *Gopichandana*, and joined at the root of the nose, like that of the Rāmānujas; but instead of a red line down the centre, they make a straight black line with the charcoal from incense offered to Nārāyaṇu'a, terminating in a round mark made with turmeric. The scriptural authorities of this sect are, besides the writings of its founder, the four *Vedas*, the *Mahābhārata*, the *Panchārātra*, and the original *Rāmāyaṇa*.

6. The *Vaiṣṇavas of Bengal*, the far greater number of worshippers of Viṣṇu'a in Bengal, form one-fifth, or, according to another estimate, nearly one-third of the population of this province. Their founder, *Chaitanya*, was the son of a Brahman settled at Nadia, but originally from Silhet. He was born in 1485, and his birth was accompanied by the usual portentous indication, described in Hindu legends, of a superhuman event. He was, in fact an incarnation of Kṛ'ṣṇu'a, who appeared for the purpose of instructing mankind in the true mode of worshipping him in this age. Up to his 24th year, Chaitanya seems to have lived without any great pretensions to sanctity; he married, it is said, a daughter of Vallabhāchārya, and supported his mother after the death of his father, which occurred in his childhood. At twenty-four, however, he shook off the obligations of society, and became an ascetic, travelled between Mathurā and Jagannāth, and taught his doctrine. At the end of his peregrinations, he nominated his two principal disciples, *Advaitānand* and *Nityānand*, to preside over the V. of Bengal, and *Rūpa* and *Saṇātana* over those of Mathurā. Chaitanya himself then settled at Cuttack, where he remained

twelve years, engaged in teaching and controversy, and in intent meditation on Kr'ishn'a. There he had frequent visions of Kr'ishna, Râdhâ, and the Gopîs, and, in one of these fits of ecstasy, was nearly drowned in the Jamna. Ultimately, he disappeared—how, is not known—about 1597. Of his two chief disciples, *Advaitânand* resided at S'ântipur, and seems to have been a man of some property and respectability. *Nityânand* was a resident of Nadîya, and a householder, and his descendants are still in existence. Besides these three Prabhûs, or chiefs, the V. of Bengal acknowledge six Gosâins as their original teachers, viz., *Rûpa*, *Sanâtan*, *Jîva*, *Raghunâth Bhat't*, *Raghunâth Dâs*, and *Gopâl Dâs*; and next to them they hold in veneration *S'rînivâsa*, *Gadâdhar Pan'dit*, *S'rî Svarûpa*, *Râmânand*, and others, including *Haridâs*, who especially obtained almost equal honor with his master Chaitanya. In addition to these chiefs, the sect claims eight eminent poets, amongst whom *Krîshna Dâs* is the most celebrated. According to the doctrine of the sect, Kr'ishn'a is the Supreme Spirit, who, for various purposes, assumed specific shapes, in which he became incarnate (see *Višn'n'u*); and so far there is not much real difference between the tenets of this and other Vaishn'ava sects. But an important innovation, introduced by its founder, is the doctrine of *Bhaktî*, or faith, which, he teaches, is infinitely more efficacious than abstraction, than knowledge of the divine nature—as enjoined by the philosophical systems—than the subjugation of the passions, than the practice of the Yoga, than charity, virtue, or anything deemed most meritorious. A consequence resulting from this doctrine is, that all castes become by such faith equally pure, and therefore that all castes are admissible into the sect; that all are at liberty to slake their social differences in the condition of ascetics, in which character they may live with each other without regard to former distinctions, and that all members of the sect are equally entitled to the food which has been previously presented to the deity. The *Bhaktî*, or faith, comprehends five stages: quietism, as that of sages; servitude, which every votary takes upon himself; friendship for the deity, such as is felt by Bûlma and others honored with his acquaintance; tender affection for the deity, of the same nature as love of parents for their children; and the highest degree of affection, such passionate attachment as the Gopîs felt for their beloved Kr'ish'n'a.

The manner of expressing these feelings in acts of divine worship is about the same as that represented by the ceremonial of the Vallabhâchâryas; but the secular worshippers are generally content with paying their homage twice a day to the idol of Kr'ishn'a. Their chief ritual is a very simple one; it consists of constantly repeating the name of Kr'ishn'a—a practice of which one of their chiefs, Haridâs, set them a remarkable example, as during many years, when he resided in a thicket, he repeated the name of Kr'ishn'a 800,000 times daily. Their other duties are sixty-four, including many moral and many absurd observances, as suppressing anger, avarice, and lust, and singing and dancing in honor of Kr'ishn'a, and fasting every eleventh day. The most important of all their obligations, however, is their servile veneration of the spiritual teacher, whom they are bound to look upon as the deity himself, and even as possessed of more authority; for they are taught that “the prayer is manifest in the Guru, and the Guru is Višn'n'u himself;” again: “First, the Guru is to be worshipped, then I (Višn'n'u) am to be worshipped;” and, “When Višn'n'u is in anger, the Guru is our protector; but when the Guru is in anger, we have none.” In this respect the doctrine of the V. of Bengal is similar to that of the Vallabhâchâryas, and their practice also agrees in so far as the V. look upon the dignity of their Gurus as hereditary, and not depending on personal capacity or sanctity; but as in the case of the Vallabhâchâryas, this practice does not appear to have been enjoined by their original teachers. Liberation from terrestrial existence, most votaries of this sect do not conceive in the spirit of the Vedânta, which teaches that final deliverance is the absorption of the human soul into the divine essence; but, in their opinion, it is twofold, either perpetual residence of the soul in Swarga, or paradise, with possession of the divine attributes of power, &c.; or elevation to *Vaikunt'hâ*, the heaven of Višn'n'u, where they enjoy felicity under one or all of the four conditions, under which also the Madhvacâryas conceive such felicity to exist. Chaitanya and his two chief disciples did not leave, as it seems, written compositions; the rest of his pupils, however, wrote numerous works in Sanscrit and Bengali. The V. of this sect are distinguished by two white perpendicular streaks of sandal,

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or *Gopichandana*, down the forehead, uniting at the root of the nose, and continuing to near the tip; by the names of *Rādhā-Kṛishṇa* stamped on the temples, breast, and arms; by a close necklace of Tulasi stalk of three strings, and a rosary of 108 or sometimes 1000 beads made of the stem of the Tulasi. The sectaries consist of every caste and order, and are governed by the descendants of their Gurus: some live in a state of celibacy; the teachers however, are married men.

There are several divisions of this sect, arising from the various forms under which Vishṇu is worshipped; but besides them, there are three which may be looked upon as seceders from the original sect—viz., the *Spasht'a Dāyakas*, the *Kartā Bhājas*, and the *Sāhujas*.

The *Spasht'a Dāyakas* deny the divine character and authority of the Guru, and allow the association of male and female conubites in one conventional abode, where their relation is that of brothers and sisters, and their common interest the worship of Kṛishṇa and Charitanya. The women act also as the spiritual teachers of the females of respectable families, and the consequence is the growing diffusion of the doctrines of this sect in Calcutta, where it is especially established.—The *Kartā Bhājas* are of very recent origin, and, as they acknowledged the absolute divinity of the Guru, there would not be much difference between them and the original body of the V. of Bengal, had they not broken through the old line of hereditary teachers, and invested a new family with spiritual power—viz., that of their founder, *Rāma-S'aran-Pāl*, who, at the beginning of this century, was successful in his attempt to create this schism.—Of the *Sāhujas*, very little is known, their professions and practices being kept secret. These are suspected not to be of a very moral character. The chief temples of the V. of Bengal are at Dwārakā, Brindāvan, Jagannāth, Nadiya, Ambikā, and Agratwipa.

Besides these Valishu'ava sects, there are others of less importance, which it must here suffice merely to enumerate by name—viz., the sect of the *Khātkins*, founded by *Kū*, the disciple of Krishṇadās, and established chiefly at Hanumangād'ni, in Oude; the *Mālik Dāsas*, founded by *Mālik Dās* about 1600, or the end of the Emperor Akbar's reign—their principal establishment is at Kara Manikpur; the *Dādā Pānthīs*, founded by *Dādā*, a pupil of one of the Kabir teachers, about the same time, and established especially in Marwar and Ajmeer; the *Rai Dāsas*, founded by *Rai Dās*, a disciple of Rāmānanda, a sect, it is said, confined to the very lowest of the mixed Hindu castes, or the workers in hides and leather; the *Send Pānthīs*, who derive their origin from *Send*, the barber, the third of Rāmānanda's disciples; the *Mirā Bāis*, a subdivision of the Vallabhāchāryas, established by *Mirā Bāi*, the daughter of a petty Rājā of Merta, and the wife of the Rān's of Udayapur; the *Sanakādī Sampradāyins*, or *Nimāvats*, throughout Upper India, founded by an ascetic Nimbāditya; the *Rādhā Vallabhīs*, who consider Hariṇam's as their founder, a personage who lived about 300 years ago, and established a monastery at Brindāvan; the *Sakhī Bhāvas*, probably owing their origin to the last-named sect; the *Charan' Dāsas*, whose chief seat is at Delhi, founded by *Charan' Dās*, a merchant of the Dhāsar tribe, who resided at Delhi, in the reign of the second Alemgr; the *Haric'handīs*; the *Sadhnā Pānthīs*, founded by *Sadhnā*, a butcher; and the *Mādhavis*, founded by *Mādhav*.—For a fuller detail, see H. H. Wilson's "Sketch of the Religious Sects of the Hindus," edited by Dr Roet in Wilson's Works, vol. i. (Lond. 1832); and on the Vallabhāchāryas, the "History of the Sect of the Mahārājas" (by Karsaudās Muli), mentioned above (Lond. 1856).

VALAIS (Ger. *Wallis*), a frontier canton of Switzerland, bounded on the n. by the cantons of Vaud and Bern, and on the s. by Italy. Area, 2090 sq. miles; pop. (1876) 100,490. It forms one long and deep valley, included between two of the loftiest mountain chains of Europe—the Pennine and the Bernese Alps—and is drained by the Upper Rhone, which, rising at its north-eastern extremity, in the glacier of the Gletschstock, falls at the western boundary of the canton into the Lake of Geneva. No European territory is more completely isolated by mountains; and it is rendered still more inaccessible by transverse chains, between which are enclosed narrow valleys. The greater part of the surface consists of barren mountain slopes; in their higher elevations, covered with the greatest of the Swiss glaciers. The forests and pastures supply the inhabitants with their chief occupations. But grain-cultivation is not absent; the chief agricultural tract being the level ground, from a quarter of a mile to three miles wide, which lies along the main chanel of the river. Here corn

enough is grown to supply the wants of the inhabitants. The heat at the bottom of the valley is intense in summer, and Indian corn and the vine are grown with great success. The V. opens into the Lake of Geneva, and is connected by great high-roads, and now by railway, with the other parts of French Switzerland and Savoy. The Grimsel and Gemul passes connect the eastern part of the valley with German Switzerland; and the Great St Bernard and Simplon (q. v.) passes connect it with Italy. Formerly, the cattle, the chief export of V., were driven over the Simplon into Italy, but now the railway, which ascends the valley as high as Sion, on the Simplon road, threatens to divert this trade to Western Switzerland and France. The inhabitants of the Upper V.—one-third of the population—speak German; those of the Lower V.; the Vaudois dialect of French. The line which separates the two languages lies along the ridges running north from the Matterhorn to a point a little to the east of Lenk. All the inhabitants are Roman Catholic. The V. is subdivided into *dixaines*, each of which has its council, and may be said to form a republic. Each of the *dixaines* sends four members to a larger council or diet meeting at Sion. The upper part of the V., throughout the middle ages, acknowledged a very slight feudal dependence on the German Empire; the lower part belonged to Savoy. At the period of the struggle of the Swiss with the Duke of Burgundy, the Upper V. took possession of the Lower V., and reduced it to the position of a vassal state; and in this condition it remained until 1798, the period of French conquest, when the distinction was set aside. As stated in the article SWITZERLAND, under the recent constitution, the suffrage was extended to the whole pop. of V., with results little expected by the Liberal party in the Swiss diet. Sion (q. v.) and Martigny (q. v.) are the chief towns.

VALCKENAER, Ludvig Kaspar, an eminent Dutch philologist, born at Leenwarden, in 1715, studied at Franeker, and in 1741, became Professor of Greek there. Subsequently, he was called to Leyden, where he died, March 14, 1785. V. was an admirable lecturer and commentator on the classics. To a thorough knowledge of their literature and antiquities, he added a fine critical discernment and thoughtfulness. Among his more notable performances are his recasting of Ursinus's "*Virgilius cum Scriptoribus Græciæ Collatus*" (Leenwarden, 1747), his editions of the Greek grammarian Ammonius (Leyd. 1759; Leip. 1822), of the "*Phœnissæ*" (Franek. 1755; Leip. 1824), and the "*Hippolytus*" (Leyd. 1768; Leip. 1822), his "*Diatribe in Euripidis Perfidiorum Dramatum Reliquias*" (Leyd. 1767; Leip. 1824); his edition of the so-called "*Epistles of Phalaris*" (Gröning. 1777), and of the "*Idylls*" of Theocritus (Leyd. 1779—1781; new ed., Leip. 1810). He also furnished a rich store of critical observations to Wesseling's Herodotus. Among his posthumous works are his "*Callimachi Elegiarum Fragmenta*" (Leyd. 1799), his "*De Aristotelo Judæo*" (Leyd. 1806), and his "*Opuscula Philologica, Critica, Oratoria*" (2 vols. Leip. 1808).

VA'LDAL HILLS. See NOVGOROD.

VALDEPEÑAS, a town of New Castle, in the modern province of Ciudad Real, and 20 miles east-south-east of the city of that name. It is a straggling, mud-built town, situated in a district celebrated for its red wine. The wine, when obtained pure, which it seldom is except at V., is rich, fruity, full-bodied, high-colored, and will improve for ten years. Pop. 11,800.

VALENCE, a town of France, capital of the dep. of Drome, in a charming situation on the flank of a hill that borders on the left bank of the Rhoue, 65 miles south of Lyon by railway. The walls with which it is surrounded give it a gloomy appearance. Silk-weaving and silk-throwing are carried on, manufactories of printed and other cottons, and commerce in silk, fruits, wines, liqueurs, and spirits. Pop. (1872) 14,967.

VALENCIA, a small island on the south-west coast of Ireland, forms part of the county Kerry, is separated from the mainland by a narrow arm of Valencia Bay, and lies 38 miles west-south-west from Killarney. It is $5\frac{1}{2}$ miles long and 2 miles broad; the soil is in many places good; half the entire area is under cultivation; and there are about 3500 inhabitants. On the west side, which is mainly high rocky moorland, there are valuable slate and flag quarries. On the north side of the island is Valencia Bay, an inlet of Dingle Bay; and Valencia Harbor, the most western in Ireland, is

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part of the bay of the same name. Here is the telegraphic station for the three Atlantic cables now in operation, which were laid in 1864, 1873, and 1874, besides the cable laid in 1865, but which is not now in operation. Another Atlantic cable starts from Balinskellig Bay, a little to the south of V. See TELEGRAPH, and ATLANTIC TELEGRAPH.

VALENCIA, former kingdom of Spain, now subdivided into the three modern provinces of Valencia, Alicante, and Castellón de la Plana (see SPAIN), comprises a tract of country in the east of Spain, washed by the Mediterranean, and bounded on the n. by Catalonia, and on the s. and s.-w. by Murcia.

In the middle districts of the kingdom are small plains, abounding in lagoons where they border on the Mediterranean, but furnished with few harbors; both in the north and south are mountain ridges, offsets from the eastern edge of the great central plateau of Spain. V. is remarkable for its fine climate, and for its fertility in the well-watered districts. The fruitful localities called the *Huertas* (gardens) yield three, and sometimes four harvests in the year. Neither wheat nor barley is largely grown, but the rice-crops are so abundant, that not only is the whole of Spain supplied with this article from V., but a considerable quantity is also exported. The country is rich in iron, lead, copper, cinabar, cobalt, and coal. The lagoons on the coast, especially that of Albufera, are rich in sea-fowl and fish. The inhabitants, in whom is observable a strong mixture of Moorish blood, are remarkably industrious, and V. is known to be the most actively manufacturing province of Spain after Catalonia.

VALENCIA, an ancient city and seaport of Spain, formerly capital of the kingdom, and now of the province of the same name, stands on the shores of the Mediterranean, 94 miles east-south-east of Madrid by railway. The Huerta—85 English sq. m. in extent—which surrounds the city resembles an immense orchard, and is ingeniously watered by an intricate network of pipes and rivulets, laid down by the Moors eight centuries ago, and efficiently answering its purpose down to the present day. In this garden, the carob, citron, orange, palm, and mulberry grow in wild luxuriance. Nature, stimulated by constant moisture and a burning sun, exhibits a wonderful strength and fecundity. V. is surrounded by old picturesque battlemented walls, erected by Pedro IV. in 1356; the interior of the city is striking and pleasing; most of the streets are macadamised; and while, in the old quarters, the houses are closely packed and gloomy-looking, well suited to keep out the enemy, *heat*—those recently erected are high, gaily-colored in blue, rose, cream-color, &c.; decorated with elegant iron-gilt balconies, and furnished with courts frescoed with flowers and cooled by fountains. V. is the see of an archbishop, and its cathedral, *La Seo*—the see—which was commenced in 1363, is classical in the interior, and Gothic in the exterior, is 350 feet long, and at the transepts, 216 feet wide. From the top of a tower which surmounts one of the portals, the view is said to be one of the most striking in Spain. In the cathedral and its chapels there are a number of magnificent pictures, including some by Ribalta and Joanes. The Church of the Colegio de Corpus is quite a museum of pictures by Ribalta, who, according to Ford, has painted heads equal to any produced by the old Venetians. There are also numerous and interesting picture-galleries, in the chief of which only the productions of the great Valencian school are to be seen. The custom-house, dating from 1758, is now the Cigar Factory, which employs 2500 women, and produces 150,000 lbs. of tobacco yearly. The university, with a public library of 43,000 vols., is well attended. Silk-spinning and weaving are extensively carried on. There are also extensive hemp and cloth weaving, and manufactures of hats, glass, linen, leather, and Valencia tiles for flooring. V. was long sunk, like the whole of the country, in a lethargic sleep, but it has, within recent years, awakened to activity. Its port has been improved; it is now connected with Madrid by railway, and being to its own metropolis what Brighton is to London, it is much visited in summer by the *Madritenos*, who contribute greatly to its prosperity. There is considerable commerce with Britain. Pop. about 110,000.

V., or *Valentia de Cid*, is a very ancient city. It was destroyed by Pompey, and rebuilt by Sertorius, after which it became a *colonia*. It was taken by the Goths in 418 A.D., and by the Moors in 712. The *Cid* took it in 1094—1095, and ruled despoti-

cally here till 1099. The union of Ferdinand and Isabella brought it under the Castilian crown. Suchet captured the city in 1810.

VALENCIA, a town of South America, Venezuela, in the province of Caracas, 85 miles west-south-west of Caracas, about two miles east of a lake of the same name, and about 90 miles from Puerto Cabello on the coast, with which and with Caracas it carries on an active trade. V. is finely situated in an exceedingly fertile district, in which cattle and horses are raised in great numbers. Population said to be 16,000.

VALENCIENNES, a manufacturing town and fortress of France, in the dep. of Nord, on the Escaut, 155 miles by railway north-north-east of Paris. It is well built, but it does not contain many objects of attraction of any sort. There are many pleasant promenades in the immediate vicinity. A famous kind of lace is made here, as well as fine woven fabrics and gauzes. Salt-making and sugar-refining are carried on, and there is an active trade in timber, wine, and oil. It is the birthplace of Watteau and Froissart. Pop. (1872) 19,609.

VALENS, emperor of the East, the brother of Valentinian I. (q. v.), was born near Cibalis in Pannonia, about 328 A.D., and was associated with his brother in imperial authority, receiving as his share of the empire, Asia, Egypt, and Thrace, March 28, 364. His sovereignty was, however, disputed by Procopius, a supposed scion of the race of Constantine, who raised his standard in Thrace, was crowned at Constantinople, and for two years maintained his ground with skill and courage, till the defeat of his troops at Thyatira and Nicosia, and his subsequent capture and cruel death, 368 A.D. The first prominent act of V.'s reign was a reduction of 25 per cent. in the taxes, which gained him the general good-will of his subjects, but was of questionable prudence in the unsettled state of the northern and eastern frontiers. The prolonged imprisonment of 8000 Ostrogoths, who had been sent to aid Procopius, led to a rupture between V. and the aged hero Hermanric, and to a war which lasted from 367 to 369. The contest was carried on in the country of the Goths, and was throughout in favor of the Romans. Difficulties arose immediately afterwards (370) with the Persians, who were desirous of possessing themselves of Armenia, and though the two powers came frequently into collision, the one as the assailant, and the other as the ally of the Armenian monarch, war was not declared till the end of 372, when the Romans were victorious. V., who had removed to Antioch at the commencement of the war, now occupied himself with the religious quarrels between the Arians and the orthodox party, which at that time raged with much violence over the whole eastern empire. Incapable of independent judgment, he had adopted the views of his Arian councillors, and under their guidance, punished the more obstinate of the "heretics." At the same time, a conspiracy, prompted by professors of magical arts, who declared that V.'s successor should be one whose name began with *Theod*, was discovered, its promoters and agents punished with death, as well as a number of persons who were so unfortunate as to possess a name commencing with the unlucky prefix. Affairs on the eastern frontier again assumed a threatening aspect; but the Romans were disinclined any longer to interfere with the designs of the Persians on Armenia, and concluded a somewhat discreditable treaty in 376. In the meantime, events were taking place on the northern frontier which were destined ere long to become of sinister import to the Roman Empire. The Goths, who had for some time been peacefully settled in Dacia, were assailed by the advancing hordes of the Huns; the Ostrogoths, who first felt the shock, were partly incorporated, and the remainder forced to retreat; the Visigoths next attempted to stem the torrent, but without success, and immense crowds of fugitives belonging to this warlike race crowded to the north bank of the Danube. V. accorded permission to a large body of Goths under Fritigern to cross into Moesia and Thrace, and take possession of the waste lands in these provinces; the fugitive Ostrogoths soon afterwards crossed the river without permission; and the alarm which the numbers and turbulence of his new subjects speedily aroused, led V. to the adoption of such impolitic measures, that the gratitude of the Goths for shelter afforded was turned to bitter resentment. V. prompted by his servile and flattering advisers, at last resolved on war; and marching against the barbarians, he engaged them near Adrianople, August 9, 378. His army was totally routed, and two-thirds of it, including V.

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himself and most of his chief officers, left dead on the field.—See Gibbon's "Decline and Fall," chaps. 35 and 36; and Tillemont's "Histoire des Empereurs," vol. v.

VALENTINE, Basil, a celebrated German alchemist, of whom so little is known that it has been disputed whether he flourished in the 13th or the 15th century. It has been maintained that he was a monk of the order of St Benedict, in St Peter's convent at Erfurt, but his name does not appear on the list at Erfurt, nor on the general list kept at Rome. It seems probable that he flourished about the end of the 15th century. He was a diligent seeker for the philosopher's stone, and wrote a large number of works, chiefly on the process of transmutation, a complete list of which will be seen in Lenglet's "History of the Hermetic Philosophy," vol. iii. Some of the titles are curious, as "Basil Valentine's Twelve Keys of Philosophy," "Apocalypsis Chymica," "Revelation of the Mystery of the Essential Colors of the Seven Metals," "The Triumphal Car of Antimony," "A Chémico-philosophical Tract concerning Things Natural and Præternatural," &c. After his death, his works were thought to be wholly lost, when they were discovered in the stone-work of the abbey, "Heaven itself conspiring to bring to light these extraordinary works by shattering by a thunderbolt the pillar in which they were concealed," if we are to believe his followers in the mystic art, who have handed the story down to us. His works were mostly written in the old Upper-Saxon dialect, and were not printed till 1602; after which time many of them were published in the form of French translations, though a few still remain in MS.

VALENTINE'S DAY, the 14th of February, is, or more correctly was, celebrated in England, Scotland, and in different parts of the continent, particularly Lorraine and Maine in France, by a very peculiar and amusing custom. On the eve of St Valentine, a number of young folk—maids and bachelors—would assemble together, and inscribe upon little billets the names of an equal number of maids and bachelors of their acquaintance, throw the whole into a receptacle of some sort, and then draw them lottery-wise—care, of course, being taken that each should draw one of the opposite sex. The person thus drawn became one's valentine. Of course, bachelors having got a valentine for one's self, one became, by the universality of the practice, some other person's valentine; but, as Misson, a learned traveller in the early part of last century, remarks, "the man struck faster to the valentine that had fallen to him, than to her to whom he had fallen." These imaginary engagements, as may readily be supposed, often led to real ones; because one necessary consequence of them was, that for a whole year, a bachelor remained bound to the service of his valentine, somewhat after the fashion of a medieval knight of romance to his lady-love. At one period, it was customary for both sexes to make each other presents, but latterly the obligation seems to have been restricted to young men. During the 15th c., this amusement was very popular among the upper classes, and at many European courts. From Pepys's "Diary," we see that in Charles II.'s reign, married as well as single people could be chosen.

For some time back, the festival—at least in England and Scotland—has ceased to possess the graceful symbolic meaning it used to have, and has become a considerable nuisance. "The approach of the day is now heralded by the appearance in the print-sellers' shop-windows of vast numbers of missives calculated for use on this occasion, each generally consisting of a single sheet of post-paper, on the first page of which is seen some ridiculous-colored caricature of the male or female figure, with a few burlesque verses below. More rarely, the print is of a sentimental kind, such as a view of Hymen's altar, with a pair undergoing initiation into wedded happiness before it, while Cupid flutters above, and hearts transfixed with his darts decorate the corners. Maid-servants and young fellows interchange such epistles with each other on the 14th of February, no doubt conceiving that the joke is amazingly good; and, generally, the newspapers do not fail to record that the London postmen delivered so many hundred thousand more letters on that day, than they do in general."—Chambers's "Book of Days," vol. i. p. 255.

The connection of the custom with St Valentine is purely accidental. In the legends of the different saints of that name recorded in the "Acta Sanctorum," no trace of the practice peculiar to the 14th of February is found. It has been suggested by Mr Douce, in his "Illustrations of Shakespeare," that the custom may have descended to us from the ancient Romans, who, during the *Lupercalia*, cele-

brated in the month of February, were wont among other things "to put the names of young women into a box, from which they were drawn by the men as chance directed;" and that the Christian clergy, finding it difficult or impossible to extirpate this pagan practice, gave it at least a religious aspect, by substituting the names of particular saints for those of the women; and it is certainly a usage more or less widely extended in the Roman Catholic Church to select, either on St Valentine's Day or some other, a patron saint for the year, who is termed a valentine. But it is far more probable that the custom of choosing valentines is a relic of that nature-religion which was undoubtedly the primitive form of religion in North-western Europe—as elsewhere; and that it sprung from a recognition of the peculiarity of the season. Hence the explanation, that "about this time of the year the birds choose their mates, and thence probably came the custom of the young men and maidens choosing valentines or special loving friends on that day." Valentines are now extensively manufactured, the demand being yearly on the increase.

VALENTINIANS, a Gnostic sect or school (see Gnosticism), founded by Valentinus, who went from Alexandria to Rome about 140 A.D., and died there, or in Cyprus, about 160. The distinguishing feature of his system lies, in the first place, in his recognising heathenism as a preparatory stage of Christianity; and then in his dividing the higher spiritual world into 15 pairs of æons, each consisting of a male and a female. The first pair, or syzygy, is made up of Bythos, or God in himself, and Ennoia, or God as existing in his own thoughts; from these emanated next Nous (Intelligence) and Aletheia (Truth), and so on. As the last æon, Sophia, transgressed the bounds that had been laid down by the æon Heros, and a part of her being became lost in Chaos, there was formed a crude being, called Achauroth, which, through the Demiurgos that emanated from it, created the corporeal world. Heros now imparted to the souls of men (for all the bodies composing the corporeal world are possessed of souls) a *pneumatic* or spiritual element, but this only attained to full activity when Christ, a collective emanation from all the æons, appeared as Saviour, and united himself with the man Jesus. In the end, all that is pneumatic, and even the originally psychic or soul element in as far as it has assimilated itself to the psychic, will return into the Pleroma.

VALENTINIANUS, the name of three Roman emperors of the same family; the first and most famous of whom, VALENTINIANUS I., was the son of Gratianus (a rope-maker who had enlisted in the army, and risen to the grade of *comes militum*), and was born at Cibalis, in Pannonia, 321 A.D. V. entered the army at an early age, and, aided by the military renown of his father, rapidly rose in rank under the emperors Constantine and Julian, only, however, to fall more rapidly; for he was degraded by Constantine in 357, and, for his publicly expressed contempt for paganism, banished by Julian in 363. Restored to favor in the following year, he distinguished himself in the East, and on the death of Jovian was unanimously chosen as his successor, February 26, 364. A month after his accession, he chose as his colleague his brother, Valens (q. v.), to whom he resigned the government of the East, reserving for himself Illyricum, Italy, the Gauls, Britain, Spain, and Africa. During V.'s reign, the utmost vigilance was required to preserve the frontier districts of the empire from the ravages of the swarms of barbarians who, like vultures, had gathered round their prey, watching with greedy eagerness the rapid decay of its strength, and ready at the first opportunity to hasten its impending doom. The Alemanni repeatedly (366—368) ravaged the east, and the Saxons (370) the north-east of Gaul; Illyricum was wasted (370) by the Quadi, and Africa by the southern desert tribes; and though these invasions were mostly repelled and revenged in a manner becoming the warriors of the queen of nations, the auxiliary means often had recourse to (e. g., the assassination of the two powerful and able opponents, the kings of the Alemanni and Quadi, and the treacherous attack on the Saxons while under the fancied security of a treaty), sorely indicated that the sturdy virtue which formerly imbued the soldiers of the empire was rapidly disappearing. The internal administration was excellent, for the emperor added to his ability, prudence, and firmness of character, the less common imperial qualities of vigilance and impartiality; and his cognizance of any abuse or injustice, by whomsoever perpetrated, was the signal for its speedy rectification, and the severe punishment of the offender. Though himself a zealous Catholic, he repelled the solicitations of the

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bishops who wished him to interfere in the religious disputes of the time, permitted his subjects to adopt whatever religion they chose, and strictly forbade all persecution or annoyance on account of religious belief, even maintaining the "pontifices" of the provinces in the privileges which they had possessed under Julian. On account of the scandalous abuse by ecclesiastics of their influence over their penitents, he excluded priests and monks from the right of succession to property; judicial proceedings were forbidden to be held in private; the extreme licence of speech hitherto allowed to advocates was judiciously restrained; gratuitous medical attendance was provided for the poor of Rome; and schools were established throughout the empire. The success of V.'s administration was doubtless much owing to his fortunate choice of officers: Theodosius the Elder in Africa and Britain, Jovinus in Gaul, and Theodosius the Younger (afterwards emperor) in Illyricum, form a trio distinguished by an unswerving loyalty, administrative ability, and military talent, rarely found in any age; and contrast strongly with their predecessors in office. V.'s private life was a model of morality and economy; and according to the summation of the accurate and trustworthy Ammianus, "he had so many good qualities, that if everything had been equal in him, he would have been another Trajan or Marcus Aurelius." But the one and grievous fault which marred his character was an ungovernable temper, which led him into the occasional commission of excessive cruelties, and ultimately caused his death; for while giving audience to the deputies of the Quadi, with whom he was then at war, he worked himself into such an access of passion as to rupture a blood-vessel in his chest, and fell back dead into the arms of his guards, November 17, 375. By his first wife, he had one son, Gratianus (q. v.); and by the second, Justina, another son, Valentinian, and three daughters, one of whom, Galla, became the wife of the Emperor Theodosius I.—VALENTINIANUS II., the younger son of the preceding, was born 373 A.D. and received from his elder brother, Gratianus (q. v.), the provinces of Italy, Illyricum, and Africa, as his share of the Western Empire. During his long minority, the Empress Justina administered the government; and about three years after her death, V., who had given promise of good administrative qualities, was murdered by the Frank, Arbogastes, the commander-in-chief of his army, May 15, 392.—VALENTINIAN III., the grand-nephew of the preceding, being the son of Constantius III. by Placidia, the daughter of Theodosius the Great and Galla, was born about 419 A.D., and was seated on the throne of the West by Theodosius II., emperor of the East, 425 A.D. V. was a weak and contemptible prince, nevertheless his reign is one of the most interesting epochs of Roman history, exhibiting as it does to the full, the internal weakness and corruption of the empire, the gradual closing with it of its irresistible barbarian foes; the sad picture being momentarily lightened from time to time with a flash of the warrior-spirit of old Rome. V. may be said never to have ruled during the 30 years that he sat disesteemed and unhonored on the imperial throne; his mother, Placidia, governed till her death in 450, and was succeeded by the eunuch, Heraclius, one of those malignant fribbles who swarmed around the throne of the falling empire. The regulations enacted for the internal administration were creditable, and especially so when ecclesiastical interests were involved, as in almost all cases, the ambitious and persecuting tendencies of the now preponderant orthodox party, were firmly restrained; while, on the other hand, the fierce vindictiveness of its more bigoted rivals was kept within bounds. But the utter corruption of manners, the complete extinction of "public spirit," the oppressive exactions of the tax collectors, and equally of the commissioners who were appointed to prevent these exactions; the general employment of the powers of the executive in the avenging of private quarrels, and the utter impossibility of obtaining redress for injuries, too plainly shewed that the empire had fallen far beyond remedy, and that if not destroyed by assailants from without, it would speedily crumble to pieces of itself. The early part of V.'s reign was disturbed by the contests between the "comites" Boniface and Aëtius, the former of whom had supported, and the latter resisted V.'s claims to the throne; but notwithstanding this, the vile and groundless calumnies of Aëtius prevailed upon the empress to declare the gallant and upright governor of Africa a public enemy; and the latter, in the first flush of resentment, called to his aid the Vandals under Genseric (q. v.). Thus Africa was lost to the empire. But Aëtius, notwithstanding, proved himself the invincible bul-

wark of the Roman power in Europe; the Franks, Goths, Burgundians, and other German nations who had encroached on the empire, were successively defeated and repelled, and the destructive career of the formidable Huns brought nigh to a close on the field of Chalons. Yet the labor of defending an extensive empire from attack on all sides was too much for one man; and consequently, much of Spain and Gaul was ultimately seized by the Suevi and Visigoths, the north of Italy was ravaged by the Huns, Sicily and Sardinia by the Vandals, and even Rome itself repeatedly besieged, while Britain was abandoned to the wild Picts and Scots. Aëtius seems to have committed the same error as his more upright and noble, though not more able, predecessor Stilicho (q. v.) in attempting, by the marriage of his son to V.'s daughter, to transfer the imperial dignity to his own family, and like him also, undermined in influence and reputation by the machinations of a eunuch, he was assassinated, though by the sword of his master (454). In the following year V., who had ravished the wife of his intimate friend Maximus, was conspired against by the friends of the latter, and the faithful adherents of Aëtius, and murdered in the midst of his guards, March 16, 455.

VALENZA (*Valentia Valentinum Forum*), a city of Northern Italy, on an elevated plain, on the right bank of the Po, eight miles north of Alessandria. It is very regularly built, and commands a fine view of the surrounding blue-clad hills. It carries on a trade in wine, and manufactures of silk, flax, and hemp fabrics. Pop. (1871) 8918.

V., a very ancient town, belonged to the Liguri, and was conquered by Marcus Fulvius, the pro-consul, who named it *Forum Fulvii, quod Valentinum*. In 1685, it was besieged for 50 days by the armies of France, Savoy, and Parma, and taken. In 1707, it came into the possession of Victor Amadeus II., Duke of Savoy; in 1805, the French destroyed its gates and fortifications; and in 1816, after the fall of Napoleon's empire, it reverted to the king of Sardinia.

VALERIAN (*Valeriana*), a genus of plants of the natural order *Valerianaceae*, an order of exogenous plants, containing nearly 200 known species, natives of temperate climates, chiefly of Europe, the mountainous parts of India, and South America; annual or perennial herbaceous plants with opposite leaves, destitute of stipules, and small flowers in cymes. They are nearly allied to *Dipsacaceae* (see *TRACHEL*), but differ in the mode of inflorescence, and in the seeds being destitute of albumen. The fruit also is not simply 1-celled, but exhibits two other abortive cells, and the stamens are 1-5, the stigmas 1-3. The corolla is sometimes spurred.—The genus *Valeriana* is distinguished by a pappus-like calyx, a spurless corolla, and three stamens. The species are pretty numerous. The common V. (*V. officinalis*) is abundant in ditches, moist woods, &c. in Britain and throughout Europe. It has a fleshy root, pinnatifid leaves, a stem 2-4 feet high, and pale flesh-colored flowers. The root is a well-known medicine, used both by physicians and as a domestic remedy in spasms, epilepsy, hysteria, and other nervous affections. It possesses powerful antispasmodic properties, and a very considerable influence over the nervous system. Cats are very fond of it, and it exercises a remarkable stimulating and intoxicating power over them. Although the plant grows chiefly in damp soils, the root is most powerfully medicinal in dry hilly ground.

The roots should be collected in autumn; and those from wild plants growing on a dry soil are preferred. The chief ingredients of valerian are woody fibre, resinous and gum-like matters, and a little more than 1 percent. of a volatile oil, which is crystallisable, and has been termed *valerole*, and in which a well-known acid (also obtained from several other sources), *valerianic* or *valeric acid*, is developed on exposure to the air. Valerian imparts its therapeutic properties, which are those of a stimulating antispasmodic agent, both to water and to alcohol. There are three official preparations—viz., the *Infusion*, the *Tincture*, and the *Ammoniated Tincture*. In large doses, valerian produces considerable disturbance of the nervous system, as headache, vertigo, and even temporary blindness. In average doses—as, for example, in from one to two ounces of infusion, and from half a drachm to two drachms of either of the tinctures—it is a very efficacious remedy in those severe cases of hysteria which closely simulate epilepsy, and in chorea. As some of the salts of valerianic acid—viz., the valerianates of soda, zinc, ammonia, iron, and quinine—act similarly to and with more certainty than the above-named preparations, we may infer that

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the therapeutic action of the remedy is solely due to the acid; and as the infusion and tinctures are by no means agreeable medicines, they will probably soon be replaced by the valerianates.

The *SMALL MARSH V.* (*V. dioica*), also a native of Britain, is much less powerful than the common species.—The greater *V.* (*V. Phu*), which grows in alpine districts of the continent of Europe, is now almost entirely disused, although it is said to be one of the strongest of the European Valeriana, a pre-eminence which, *V. Dioscoridis* disputes with it.—*V. Celtica* and *V. Salusina* are gathered near the limits of perpetual snow on the mountains of Styria and Carinthia, and carried into Turkey and Egypt, and thence into India and Ethiopia to be used to aromatise baths, and as a substitute for *SPICKHARD* (q. v.)—*V. Sitchensis*, a native of the north-west of America, is said to possess the medicinal properties of the genus in great perfection. *V. Hardwickii* is used medicinally in Nepal.—The root of *V. edulis*, a species found in the north-west of America, is an article of food of the Indians.—*Corn Salad* (q. v.) or *Lamb's Lettuce* belongs to the order *Valerianaceae*.

VALERIANE'LLA. See CORN SALAD.

VALERIAN'IC or Valeric acid is one of the volatile fatty acids represented by the general formula $\text{HO.C}_n\text{H}_{2n-1}\text{O}_2$, or $\text{C}_n\text{H}_{2n}\text{O}_2$. Its composition is represented by the formula $\text{HO.C}_{10}\text{H}_{19}\text{O}_2$; and amongst its chief properties it may be noticed that it is a limpid, colorless, oily fluid of a penetrating odor, allied to that of valerian root, and an acid taste. It renders paper transparent, but the spots disappear on exposure to the air. Its specific gravity is 0.94, it boils at 247° , and may be distilled without change; and its vapor is inflammable. It is only slightly soluble in water, but dissolves in alcohol and ether in all proportions. It exists in and is obtained by distilling valerian root with water acidulated with sulphuric acid. It may be similarly obtained from angelica root, and some other vegetable sources. It is also formed during the oxidation of fats and fatty acids (especially oleic acid), either by nitric acid or mere exposure to the air, by the oxidation and putrefaction of the albuminates, &c.; but the best method of procuring it is by distilling a mixture of amylic alcohol (or fousel oil) with bichromate of potash and sulphuric acid.

The salts of valerianic acid—the valerianates or valerates, as it is now becoming the fashion to call them—are formed either by saturating the base or its carbonate with the free acid, or by double decomposition, their general formula being $\text{MO.C}_{10}\text{H}_{19}\text{O}_2$, when M is any metal. The alkaline valerianates are very soluble, and are not easily obtained in crystals; but most of the other salts occur in sacreous scales, and all of them, when moist, have the smell and taste of valerian.

The following salts are used in medicine: *Valerianate of soda*, which is included in *Pharm. Br.* *Valerianate of zinc*, which is also included in *Pharm. Br.*, and occurs in brilliant white pearly tabular crystals, with a feeble odor of valerianic acid and a metallic taste, is scarcely soluble in cold water or in ether, but insoluble in hot water and alcohol. Besides these officinal salts, the valerianates of ammonia, of iron, and of quinia are employed in the same cases as the preparations of valerian, the doses averaging from half a grain to three or four times that amount three times a day in pills, except in the case of the ammonia salt, which is best given in solution. *Valerianate of oxide of amyli* ($\text{C}_{10}\text{H}_{11}\text{O.C}_{10}\text{H}_{19}\text{O}_2$) is a volatile fluid with a penetrating odor of apples, boiling at about 260° , slightly soluble in water, but dissolving freely in spirit and in ether. In the form of a dilute spirituous solution, it so strongly resembles apples in its smell, that it is used in perfumery under the title of *oil of apples*.

VALERIA'NUS, P. Licinius, Roman emperor, was descended from an ancient and noble family, and after distinguishing himself in the various posts which he was selected to fill by masters who appreciated his talents and virtues, was chosen for his integrity and accomplishments to the office of censor. Faithful in his allegiance to Gallus, he went to summon the legions of Gaul and Germany to aid the feeble emperor against the usurper Maximilianus, but arrived too late to save his master. The usurper's troops, awed by the superior numbers of V.'s army, and the stern sanctity of their leader's character, murdered their own chief, and united with their late antagonists in proclaiming V. emperor, 253 A.D. V. was then about 60 years of age, and feeling his inability to sustain, unaided, the cares of empire, assumed as colleague his eldest son, Gallienus (q. v.). V. shewed abundant proof during his

short reign of most ardent zeal for the prosperity of the empire; but the times required a ruler of more energy and ability; as the grave disturbances which arose throughout the empire, the irresistible irruption of the Franks into Gaul, despite the utmost efforts of Aurelian (q. v.), the devastation of Thrace, Macedonia, Greece, and the Archipelago by the Goths, the advance of the Alemanni to Milan, and the conquest of Syria and Armenia by Shapur, amply testified. The troubles in the East appearing most threatening, V. went thither in person, and for some time fortune favored his standard; but pursuing his opponents too rashly, he was suddenly attacked by superior numbers at Edessa, completely defeated, and himself, with the remnant of his army, forced to surrender, 260 A.D. The statements regarding the indignities heaped upon the unfortunate captive by his haughty conqueror, are probably false, or, at least, much exaggerated; but of one thing we are assured, that V. languished till death in hopeless captivity; and after his death, his skin was flayed off, stuffed, preserved as a proud trophy of victory, which was invariably exhibited to the ambassadors from Rome to the Sassanide court.

VALETTE, an important fortress and beautiful city, capital of the island of Malta, on the north-east side of which, in lat. 35° 53', long. 14° 31', it is situated. It occupies a tongue of land, which runs out in a north-east direction, is 3200 yards long, and generally about 1200 yards across, except at the extremity, where it narrows considerably, and forms the famous Point of St Elmo, on which are a powerful fort and a light-house. From this point to its landward end, the neck of land, which is well named the "Hog's Back," rises gradually; and there is a downward slope from the central ridge to the Great Harbor on the right, and to the Marsa-Muscicet, the quarantine harbor, on the left. Eight principal streets traverse the peninsula, and are intersected by cross-streets, that pass over the central ridge, and afford communication from harbor to harbor. These cross-streets are necessarily very steep at the extremities, where they rise from the shores by long flights of stairs. The town and harbors are defended by a series of fortifications of great strength. They are mostly hewn out of the solid rock, and, mounted with the most powerful artillery, are considered impregnable. The city is divided into five quarters—the *Citta Nuova*, or Valetta Proper, Floriana, Vittoriosa, Sanglea, and Barmola. Besides the enormous forts, balconies, and battlements, which are the principal architectural characteristics of the city, V. contains many noble edifices. The governor's palace—formerly that of the Grand Masters—is unadorned without, but magnificent within, and possesses an interesting armory; the "con-" (i. e., joint) cathedral of St John is a superb structure; and the church of San Pubblilo, with its famed *sotteraneo* (vault) of embalmed monks and skeletons; the public library, 60,000 vols.; the university; and the aqueduct, which brings water to the city from the far side of the island, a distance of 8½ miles, are worthy of notice. The city was founded by the Grand Master Valette—from whom it derives its name—in 1566. V. is the centre of the commerce of the island, for which, as well as for the principal historical incidents with which its name is associated, see MALTA. Pop. upwards of 60,000.

VALETTE, John Parisot de la, a Grand Master of the Knights of St John, celebrated for his gallant defence of Malta against a powerful fleet of the Turks, which must be regarded as mainly instrumental in checking the westward progress of the arms of Solymán the Great, long the terror of Europe and of Christendom. La V. was born of a noble family, in 1494; and at a very early age entered the order of St John, in which he soon distinguished himself by his enthusiastic bravery and his skill in arms. His chief distinctions, even in youth, were won in the naval service in the Mediterranean, where the Turkish power was especially formidable. On the death of Claude la Sangle, Grand Master of the order, La V. was elected to that office, being the 48th in the list of the grand masters. Still directing the energies of the order in the same course, he succeeded, within the first five years of his Grand-mastership, in capturing 60 great galleys from the Turks, and an immense number of smaller vessels of war; a success which so stirred the indignation of the sultan, that he resolved on the capture of Malta, and the destruction of the Knights. Accordingly, on the 18th May, 1565, an immense fleet, of 169 ships, conveying a body of 80,000 janizaries and *spahis*, appeared off the harbor of Malta, and after failing in several assaults, formally invested the island. Alone and unsupported by any of the Christian powers, the gallant La V. maintained the fortress under circumstances of extreme difficulty and distress of every kind; and when, all further resistance

seeming to be hopeless, he was urged to capitulate, his reply was, that the life of a worn-out soldier, of 71 years, could not be better spent than in such a service. At last, at the end of four months, and after a loss, it is said, of 20,000 men, the Turkish fleet was forced to raise the blockade and withdraw from the island. **LA V.** died three years later, August 21, 1563.—There is another **LA VALETTE**, a father of the Jesuit Society, who obtained a very different sort of notoriety in the latter half of the 18th century. Having engaged, contrary to the prohibition of Benedict XIV., as a trader in the products of the large estates held by the Jesuits in the Philippine Islands, and being unable, in consequence of the capture of his ships by an English privateer, to meet his engagements, a suit was commenced in the French courts against the French province of the Society, the proceedings in which suit were among the causes which precipitated the expulsion of the Society from France, and its eventual suppression by Clement XIV. See **JESUITA**.

VALGUARNE'RA, a town of Sicily, in the province of Caltanissetta, 48 miles north-east of Girgenti, in a mountainous district. Pop. about 9500.

VA'LGUS is a term employed in Surgery to designate a variety of Club-foot (q. v.). The corresponding Latin word signifies "having legs bent outwards, bow-legged," and is probably derived from *volvo*, "to turn or twist." As it is an adjective, the substantive, *Talipes* (an unclassical word, indicating "weakness of the feet," but in surgical nomenclature signifying "club-foot") must be regarded as understood.

VALLA, Laurentius, one of the first scholars of the Renaissance, was born at Rome in 1415, taught classics in various places in the north of Italy; but in 1443, on account of his assaults on the scholastic philosophy, and his defence of Epicurus, found it advisable to seek protection at Naples from Alfonso V. Here, however, he soon fell under a suspicion of heresy, and was, it is said, dragged for punishment before the Inquisition. Aided by the king, he made his escape, and fled to Rome, where Pope Nicholas V. pardoned him, received him into favor, and appointed him papal secretary and canon in the church of St John Lateran. He died 1466. V.'s Latin translations of Herodotus (Par. 1510) and Thucydides (Lyon, 1543) are admirable, and had a great influence in spreading a knowledge of classic history; but the work that brought him most renown was the "Elegantie Latini Sermonis" (6 books: Rome, 1471), which long served as a model in style to Latinists. From 1471 to 1536, no fewer than 59 editions of it appeared. It has passages of noble eloquence in praise of the glorious tongue of Rome, through which one discerns a passionate desire for the unity of Italy—that now attained aspiration of Italian scholars and writers. The "Elegantie" is, moreover, full of nice grammatical observations, particularly on synonyms. V. has also the credit of being the first of the Renaissance scholars that used his classical culture in the criticism of the New Testament ("Annotationes in Novum Testamentum," published by Erasmus). In his "De Donatione Constantini Magni," he demonstrated the historical groundlessness of the pretended "Donation" of Constantine, and inveighed against the popes for their grasping after temporal power; but this he was forced to retract. A collected edition of V.'s works appeared at Basel in 1543.

VALLABHA AND VALLABHACHÄRYAS. See under **VAISHN'AVAS**.

VALLADOLÍD, a famous city of Spain, sometime capital of the whole country, and still capital of the province of the same name (see **CASTILE**), stands on a wide, wind-blown plain on the left bank of the Pisuerga, 150 miles north-west of Madrid by railway. It is 2100 feet above sea-level, and has a healthy climate, the air being pure and genial, and the sky generally cloudless. Having been the residence of the court prior to its removal to Madrid at the close of the 16th c., the city contains many large and decayed dwellings; although, with the returning prosperity of the town, new mansions are being erected, and the streets are being paved, enlarged and multiplied. In the Plaza de Campo, the site of famous tournaments, *autos de fé*, decapitations, and bull-fights, Napoleon reviewed 35,000 troops. The Plaza de Toros, or bull-arena, can accommodate 10,000 persons. The Museo, which contains such of the statues, carvings, and sculptures as could be collected at the suppression of convents in the province, is an elegant building, containing a grand saloon, six rooms filled with pictures, and three with sculptures. Of these treasures,

the sculptures are the most valuable, though among the pictures are several by Rubens. Near the Palacio Real (royal palace), are the remains of two of the noblest Gothic religious edifices in the world, the convent of San Pablo, and the Colegio de San Gregorio, both richly and beautifully decorated, but much damaged by the French soldiery. V. is admirably situated for trade and manufactures. There is abundant water for irrigation, and the surrounding district is remarkably fertile. It communicates with the Atlantic by the Douro, and with the middle and south of Spain by canals and railways. Manufactures are springing up in the city; the soil in the vicinity is being improved by companies instituted for that purpose; and in other respects, V. gives tokens of revival. Silk, cotton, and woollen stuffs; jewellery, hats, paper, perfumery, &c., are manufactured. Pop. about 50,000.

V., the *Pincia* of Ptolemy, is first mentioned under its present name in 1072. Charles V. erected many splendid edifices here. About this time, V. was the most prosperous city in Spain, containing 100,000 inhabitants. Formerly capital of Castile and Leon, it was still the residence of the kings and the usual resort of foreigners. In 1560, Madrid was declared the only court; and from this time the prosperity of V. declined. Since 1851 it has been the seat of an archbishopric, and has still its university.

VALLADOLID, a town of Mexico, in the state of Yucatan, 96 miles east-south-east of Merida, stands in the midst of a highly cultivated tract of country. It is the best constructed and the healthiest town in Yucatan, and the seat of cotton manufactures. Pop. 15,000.

VALLARY CROWN (Lat. *corona vallis* or *castrensis*), a crown bestowed by the ancient Romans as an honorary reward on the soldier who first surmounted the outworks, and broke into the enemy's camp. It is in form a circle of gold with palisades attached. The crown vallary occasionally occurs as a heraldic bearing.

VALLEY, a hollow tract on the earth's surface between hills or mountains. Valleys are generally parallel to the direction of the ridges of elevated ground; but some are transverse, cutting through the mountain-chain. They have a watercourse or near their lowest level. The main valley is that which has the river of the drainage-system to which it belongs flowing through it, while the tributary streams which feed this river flow through lateral valleys. The terms upper and lower valley denote parts of the same valley, as related to the source or to the mouth of the river which flows through it. In a narrow valley, the river always occupies the lowest part; but in wide valleys, especially in those in which waters run that are largely charged with sediment, the river often builds up a channel for itself, that is higher than the ground at the foot of the hills. The river, in its floods, bears a large amount of mud, which it continues to carry as long as the water is retained within its bed; but whenever it overflows its banks, the velocity is reduced, and the heavier particles, which form the bulk of the sediment, are deposited near the river's course; while, flowing over the surface of the level ground, even the finer particles fall to the bottom, until as it reaches the limits of the valley, the water gradually becomes clearer. The Rhine, the Nile, and indeed almost all great rivers in wide valleys, illustrate this phenomenon. The river seldom flows through the middle of the valley, but is generally nearest to that side where the slope to the high ground is steepest; the opposite side of the main valley presenting a more gradual rise to the mountain summits, supplies the chief lateral valleys and feeding-streams to the river.

The origin of valleys has been a subject of considerable controversy, and this question is even now occupying the attention of geologists. At the time when a universal deluge was used to explain whatever was inexplicable in geology, it was considered to have been the agent which furrowed the earth's surface with valleys; and this opinion was entertained so lately, as to have been advocated by the late Dean Buckland in his "Reliquiæ Diluvianæ," until Professor Fleming shewed the untenableness of these opinions.

At the present day, geologists are very much divided as to the origin of valleys. Some hold that they are the result of the operation of that internal agency which has, at different periods, so broken the crust of the earth, and changed its surface; while others maintain that various agents now operating more or less favorably in disintegrating and removing the solid materials of the exposed portion of the surface of the earth, produced the inequalities that now exist. There can be no doubt that

all these have been active, and that the special advocacy of individual agents, as the sole producers of these phenomena, is the source of error, and the cause of controversy. Each and all have done their part; and in a satisfactory explanation, they must all be taken into account. That internal force has been a principal agent in producing the diversity of hill and valley, seems beyond doubt. This force acted by raising the surface perpendicularly from below upwards; by producing great faults, which presented facilities for the action of running water; or by pushing a portion of the crust forward, so as to produce immense folds, alternating with mountain ranges. The Appalachians of North America, and the associated valleys, have been produced, as has been shewn by Professor Rogers, by the last-mentioned method; and the Tertiary strata of the Alps were carried up a thousand feet, while the valley-beds of the Adriatic and the Mediterranean either remained stationary or subsided to a lower level. The fact that some valleys are only the synclinal axes between the bounding mountain systems, like the basin of Switzerland between the elevated ridges of the Alps and Jura, also confirms the opinion that some valleys owe their origin to the operations of an internal force, which operated in geologic ages in a more powerful manner than it has been known to do in historical times. In the face of such facts, it is surprising to hear practical geologists so influenced by Pet theories as to assert that the action of internal force has "no direct effect on the external features of the ground." But this is the position of men who adhere to the strict Lyellian doctrine, that all the past changes on the earth's surface have been produced by agents now operating, and at the same rate, but through enormously protracted periods of time. But as these agents are various, so we have almost as many theories as there are agents. Lyell insists that ocean-currents, and the wear and tear of the waves, have produced the inequalities. Jukes will have it that the atmosphere has disintegrated, and the rivers carried off the materials which formerly filled up the hollowed-out valley to a level with the surrounding hills; while Ramsay declares that glaciers were the important agents in the process. That any one of these alone has produced the great changes on the surface of the earth, is a position that would be maintained only by those who are blinded by their idol of a favorite hypothesis which they have to defend. But that all of them, in addition to the operation of an internal force, have been agents, more or less, in producing the present conformation of the earth's surface, cannot be doubted. While the advocates of superficial agents so completely ignore the influence of internal force, as in the statement of Professor Jukes quoted, those who maintain the opposite view are equally open to condemnation when they declare that "the wear and tear due to atmospheric sub-aërial erosive agency never could, even after operating for countless ages, have originated and deepened any of the valleys which occur in flat countries."—Murchison's Address at British Association, 1865.

VALLISNERIA, a genus of small, stemless, aquatic plants, with grass-like leaves, belonging to the natural order *Hydrocharideæ*, and found in the warm parts of both hemispheres. They generally grow in running waters. *V. spiralis* is particularly celebrated on account of its peculiar process of fecundation. At the time when this is to take place, the flowers of the female plants rise to the surface of the water by means of their long spirally-twisted stalks. The flowers of the male plants, in order to follow them thither, become detached, having previously grown in short spikes at the bottom of the water, and expanded, floating about upon the surface. After fecundation, the female flowers return under the water by the spiral contraction of their stalks, and the fruit is ripened under water. This plant is found in ditches and bogs in Italy and the south of France.

VALLOMBROSA, a celebrated abbey of Tuscany, situated among the Apennines, in a valley surrounded by forests of fir, beech, and chestnut-trees (hence the name, meaning "shady valley"). Here an order of monks according to the rule of St. Benedict was founded about the middle of the 11th c., who were called Vallombrosians from the name of the site, or Grey Monks, from the color of their habit, which, however, was afterwards changed to black. They were the first to admit lay brethren. The monastery became very wealthy through donations, and the present magnificent buildings were erected in 1637. It formed a refuge for priests during French rule in Italy. After 1815, the monks resumed possession, but in very dimin-

ished numbers. In 1808 the monastery was suppressed, and the buildings were made use of for a royal academy of forestry. The monastery and its highly picturesque environs are still much visited by artists and tourists.

Vallombrosa was visited by Dante, celebrated by Ariosto in the "*Orlando Furioso*," canto xxii., and is mentioned by Milton in the "*Paradise Lost*."

VALLS, an old-fashioned town of Spain, in the province of Tarragona, in a plain watered by the Francolí, 55 miles west of Barcelona. V. is surrounded by ancient walls, has manufactures of cotton, woollen, silk, leather, and soap. The French, under St Cyr, defeated the Spanish here in 1809; but were in their turn defeated in 1811. Pop. 12,655.

VALMY, a French village in the dep. of Marne, 30 miles north-east from Chalons. In 1793, the Prussians, under the Duke of Brunswick, after capturing Longwy and Verdun, were advancing towards Paris, driving the army of Dumouriez before them, when Kellermann (q. v.), who commanded the army of the Rhine, learning the critical situation of his comrade, hastened to his relief with 22,000 men, and taking up his position on the heights of Valmy, awaited the advance of the Prussians. These, possessing themselves of the heights of La Lune, immediately opened a vigorous cannonade on the French, to which the latter effectively replied. The explosion of two ammunition-wagons within the French lines having thrown them into disorder, a body of Prussians, taking advantage of the confusion, advanced to the attack; but the energetic conduct of Kellermann, and the enthusiasm infused by him into his troops, restored their steadiness, and by a sudden charge with the bayonet, the Prussians were made to retire to their former position. This battle, or rather skirmish, frequently alluded to as the *cannonade of Valmy*, did not cost either army more than 800 men, but though, in a military point of view, an insignificant affair, it produced moral effects of the greatest importance. It was the first triumph of the republican arms, and with characteristic impulsiveness, the French were transferred from the depths of despair to the very pinnacle of self-confidence. When Napoleon was creating his "*noblesse*," this great service rendered to France by Kellermann was fitly remembered by his nomination as *Duc de Valmy*.

VALOIS, House of, a branch of the CAPETIAN dynasty (q. v.), which possessed the throne of France from 1327 till 1589, originated in the person of Charles, second son of King Philippe III. (*le Hardi*), who obtained in 1285 the county of Valois in appanage from his father. Previously, the county of Valois had been possessed by a cadet branch of the great House of Vermandois; but on the union of the heiress of of Vermandois with Count Hugh the Great, the younger son of King Henry I., and the failure of their descendants in the end of the 12th c., the Vermandois possessions, including Valois, were annexed to the French crown, till again separated in 1236, as above mentioned. But Philippe IV., the elder brother of Charles, having left three sons, who reigned in succession, and died without issue male, the succession fell, by the Salic law, to the eldest son of Charles, who accordingly ascended the throne as PHILIPPE VI. (q. v.). The elevation of the House of V. to the throne of France gave rise to long and bloody wars with Edward III. of England, who claimed the crown through his mother, Isabel, the daughter of Philippe IV., insisting that the Salic law only prohibited the "*succession*" of females, and did not deny their capacity for transmitting a claim to the crown. But if Edward III.'s argument had been sound, it would have destroyed his rival's claim without benefiting himself, for the real heirs to the throne would have then been the Navarrese royal family, who were descended from the eldest daughter of Louis X. Edward, nevertheless, assumed the title of *King of France*, an example followed by all his successors till George III., and maintained his claims by force of arms till, by the mediation of the pope, a partition of the kingdom was effected. The French crown fell, by regular succession of son to father, to JOHN THE GOOD (1350—1364), CHARLES V. (1364—1380), CHARLES VI. (1380—1422), CHARLES VII. (1422—1461), LOUIS XI. (1461—1483), and CHARLES VIII. (1483—1498), under the first four of whom the contest with England was carried on with spirit, at first to the advantage of the English, but latterly of the French, who, under Charles VII., succeeded in driving the English from all their strongholds, Calais alone excepted. Charles VIII. having died without leaving male issue, the crown fell to the representative of the nearest collateral male line—that is, to Louis, son of Charles, Duke of Orleans, and

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grandson of Louis, Duke of Orleans, the younger brother of Charles VI., who ascended the throne as Louis XII. (1498—1515), the first of the Valois-Orleans régime; but he also dying without male issue, the succession devolved upon the descendants of his uncle, Count Jean of Angoulême, whose grandson, FRANCIS I. (1515—1547), next obtained the sceptre, which he transmitted to his son, HENRY II. (1547—1559). Henry's three sons, FRANCIS II. (1559—1560), CHARLES IX. (1560—1574), and HENRY III. (1574—1589), occupied the throne in succession; but none of them leaving lawful male heirs, and all the collateral male lines proceeding from Philippe III. having become extinct, the crown passed to the House of Bourbon (q. v.), which was descended from his younger brother, Robert.

The most distinguished cadet branches of the royal line of V. were, the ducal family of Anjou, which long contended with the Aragonese royal family the possession of Naples; the last and most celebrated ducal House of Burgundy; and the illegitimate line of Dunois and Longueville, which was so productive of eminent warriors and daring politicians.

The V. monarchs of the elder line were a succession of able rulers, who, by valor and policy, wrested France from the hands of the English, and firmly established the royal authority over their powerful, proud, and turbulent nobility; those of the younger, or *Valois-Orleans* and *Valois-Orleans-Angoulême* lines were, with the single exception of Francis I., a series of weak princes, under whose feeble rule the country was distracted by contests for power between rival nobles and religious dissension among the people at large, though, owing to the number of able men on whom devolved the cares of government, the country suffered less from the incapacity of its monarchs than might have been expected.

VALON'IA, an article very extensively used by tanners, in consequence of the quantity of tannic acid which it contains. It is the acorn-cup of a species of oak (*Quercus Egilope*), indigenous to Asiatic Turkey. It is very largely imported into Great Britain from Smyrna and the Greek Isles; as much as 44,000 tons have been received in one year. In 1875, the imports were 24,267 tons; value £617,961.

VALPARAISO, the most important trading-town of Chili, South America, is situated in the province and on the bay of the same name, about 90 miles west-north-west of Santiago (q. v.), with which it is connected by railway. It is chiefly built on a narrow strip of land, at the head of the bay. It contains theatres, colleges, hospitals, and a number of scientific and literary institutions; its streets, though narrow, are well paved; and its houses, almost all two stories high, are gaily painted, and furnished with balconies. The picturesque Bay of Valparaiso, which is generally crowded with ships, is sheltered from all quarters except the north; and in the winter months, when northern gales prevail, the anchorage is considered dangerous. In 1832, the town was nearly destroyed by an earthquake; and on several occasions since that time, its progress has been checked by the same cause: in spite of this, however, V. has made great progress within recent years, its population having increased from under 10,000 in 1825, to 27,575 in 1875. Fifteen forts, mostly new, defend the bay. Nearly 8000 vessels, of about 700,000 tons, enter and clear the port annually; the imports, which value about 17,000,000 dollars, being chiefly cotton, silk, and woollen goods, hardware, iron, sugar, wines, spirits, tobacco, &c.; and the exports, which value 9,000,000 dollars, being chiefly copper and copper ore, silver, gold, wheat, flour, tallow, hides, and wool. V. was bombarded by the Spanish fleet, March 31, 1866. Few lives were lost, but buildings and other property, the value of which was estimated at from 9,000,000 to 20,000,000 dollars, were destroyed.

VALUATIONS OF LAND have been found necessary in order both to regulate liability to taxation, and in feudal times to determine the amount of casualties or occasional profits due by the vassal to the superior. Domesday Book (q. v.) contains the earliest valuation of the lands of England. Valuations were made in succeeding times, when the raising of imposts by subsidies became common, these imposts being apportioned on the people of the realm in respect of their reputed estates. Land was the chief subject of taxation, and was assessed nominally at the rate of 4s. per pound. But while land was rapidly increasing in value, the practice grew up of adopting an old valuation, by adhering to which the nominal 4s. rate came in course of time to amount to less than 2d. per pound. In 1692, it was resolved that a new valuation, correspondent to the existing state of the land, should be made,

and a tax levied on all land throughout the realm of 1s. per pound, which in time of war was afterwards raised to 4s. This impost, called the Land Tax, was made permanent by 88 Geo. III. c. 60, which act also provided the means of enabling it to be redeemed. Though once the most productive of all the resources of the state, the land tax now furnishes a very small fraction of the revenue, and so far as not redeemed, it is still collected on the basis of the valuation of 1692, which has long ceased to be an approximate estimate of the value of land. In the collection of the income tax, the actual value, as annually fixed by commissioners and assessors, is adopted as the criterion.

In Scotland, the contributions levied in the 18th c. seem to have been made with reference to the value of the lands as ascertained, either by some general valuation, or by separate valuations in individual returns. The value as at that period was afterwards known as the *old extent*, or old valuation. In the beginning of the 14th c., land diminished greatly in value in those parts of the country that had been subjected to the ravages of war; and the Scottish parliament, in granting a subsidy to Robert I. of a tenth penny of all the rents of the laity, provided that those lands which had been wasted by the war should be revalued, and that the returns should state both the present value and the former value in time of peace. But in the course of time, as prosperity returned to Scotland, the revaluation or *new extent*, as it was called, came to be above instead of below the old value; and it became the practice to estimate the new extent by adding a certain proportion of the old valuation, to compensate for the advanced improvement in the country, and the change in the value of money. Under Cromwell, and after the Restoration, in Scotland as well as in England, the mode of taxation adopted was first to name the sum to be raised, and then to distribute it among the counties; and an act of convention of 1667 directed that in apportioning the taxation of each county on the individual landholders, it should be in the power of the commissioners to rectify the old valuations when necessary. The rent established by these valuations is known as the *valued rent*, and continued till 1854 to be adopted for the land tax, and most of the other public and parochial assessments. By a statute of that year (17 and 18 Vict. c. 91), the commissioners of supply of every county, and the magistrates of every burgh, are directed to cause a valuation roll to be made up annually, shewing the rent or value of the whole lands and heritages within the county or burgh, by which roll all local assessments are in future to be regulated; and provision is made for the appointment of assessors to carry out the act. By 20 and 21 Vict. c. 58, commissioners of supply and burgh magistrates are further empowered to appoint the officers of inland revenue belonging to the county or burgh assessors; and failing their doing so, the valuations made are not to be conclusive against assessments. The new system of valuation established by these acts is perhaps the most perfect in the world; it possesses the merit of giving universal satisfaction, and is noted for its simplicity.

VALUE, in Political Economy, is one of those terms which demand attention more for the clearing away of its application to vague and fallacious uses, than for an attempt to give it strict scientific definitions. It has a distinct meaning only when it is used as "value in exchange," and that between things co-existing in time and place. The measure of such value is the current money of the place. So two articles, each of which will bring £5 in London, are equivalent in value there. Cost has nothing to do with value. If a bale of silk has cost £100, and from disease in the silk-worm, the price of the commodity rises, so that it will bring £150, that is its value. So also if there be a fall, so that it only will bring £75, that is its value. Vain endeavors have been made to establish a permanent standard of value for the purposes of comparing with each other the conditions of people living at long intervals. The changes which affect one thing affect all others; so that comparisons resolve themselves into the nature of fluxions. Money, so effective in estimating contemporary values, is quite useless here. Some years ago, grain, as the necessary of life, was used as a standard of value. It may be an approximate standard, while a people are so poor as to possess little more than the necessities of life; but when a country becomes so rich that these are but a proportion of the wealth to be estimated, their capacity as a standard is gone.

VAMBERG, Arminius, traveller and philologist, was born in Hungary in 1832. He was compelled to leave his country after the revolution of 1848, and went

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to Constantinople, where he devoted himself to studying Oriental languages. In 1861—1864 he travelled, in the disguise of a dervish, by routes unknown to Europeans, through the deserts of the Oxus to Khiva, and thence by Bokhara to Samarkand. His position precluded him from making instrumental observations for the purposes of geography, but was eminently favorable to an insight into the customs and language of the people visited. On this account, therefore, his "*Travels and Adventures in Central Asia*," published at London in 1864, is a very valuable work. His other publications are "*Wanderings and Adventures in Persia*" (1867); "*Sketches of Central Asia*" (1869); "*History of Bokhara*" (1873); and "*Central Asia and the Anglo-Russian Question*" (1874). V. is now professor of Oriental languages at the University of Pesth.

VAMBRACED, in Heraldry (Fr. *avant-bras*, forearm), a term applied to an arm clothed in armor, a dexter arm, embowed vambraced proper, the gauntlet holding a sword below the hilt in bend sinister, point downwards, argent hilt and pomel or.

VAMPIRE (Ger. *vampyr*), called also by the Servians *Vukodlak*, and by the Wallachians *Murony*, is, according to the popular belief of the Slavonic, Romanic, and Greek population of the Lower Danube and the Thessalian peninsula, a blood-sucking ghost. In the mythology of the ancient Greeks, beings of a similar nature existed—the Lamas, beautiful phantom women, who, by all sorts of voluptuous delusions, allured youths to them in order to feast on their flesh, young, and pure blood and flesh. And among the Greek Christians there is a belief that the bodies of those who have died in excommunication are kept by the devil in a kind of life; that they go forth from their graves by night and suddenly destroy other men, and also by other means procure food, and thus keep themselves in good condition. They are called *Burkolakki*, or *Tympanita*; and the only way of escaping from their molestation is by digging up their unwashed corpses and burning them, after the removal of the excommunication. The vampire proper is the illegitimate offspring of parents themselves illegitimate, or the troubled spirit of one killed by a vampire. During the day he lies as a corpse, but turned in his grave, with a sordid appearance and warm blood, open staring eyes, and skin, hair, and nails still growing. But by night, especially at full moon, he wanders about in the form of a dog, frog, toad, cat, flea, louse, bug, spider, &c., and sucks the blood from living persons by biting them in the back or neck. If a dead person is under suspicion of being a vampire, his body is disinterred, and if it is found putrid it is only sprinkled with holy water by the priest; but if it is red and bloody, the devil is driven out, and on reinterring it, a stake is driven through the breast, or a nail through the forehead; or it is perhaps burned. The *Vukodlaks*, who are particularly greedy for the blood of young girls, pair with the *Wjeschitza*, a female ghost with wings of fire, which by night sinks down on the breast of the sleeping soldier, presses him in her arms, and inspires him with her fury. As, according to popular belief, every one who is killed by a vampire becomes himself a vampire, an outward sign of the vampire bite usually remains, although not always visible and recognizable by every one; therefore, at the obsequies of every Wallachian, of whatever age or sex, there is always a skilled person, generally a midwife, called in, in order to take precautions against the corpse becoming a vampire. A long nail, for instance, is driven through the skull; it is then rubbed in various places with the lard of a pig killed on St Ignatius's day, and a stick made of the stem of a wild rose is laid beside it. Thessaly, Epirus, and the Wallachians of the Pludus know another kind of vampire still—living men who by night leave their shepherd dwellings, and, roving about, bite and tear everything that they meet, men as well as beasts. The *Priccolitch* and the *Priccolitchone* of the Moldavo-Wallachians, who wanders about more frequently than the *Murony* proper, is likewise a real living man, who, by night, in the form of a dog, roams over heaths, pastures, and villages; and especially kills cattle and sucks their blood, from which cause he always looks healthy and blooming. Such a man is known by his backbone being prolonged in the form of a dog's tail. Thus, the *Vukodlak* and the *Murony* would be something analogous to the nightmare of German mythology; and the *Priccolitch*, on the other hand, to the *Werwolf* (q. v.). The *ghosts* of the Arabs and Persians would seem to be identical with the vampires. In 1725 and 1723 excit-

ing rumors about supposed vampires arose in Hungary and Servia, which resulted in the disinterment of numerous corpses, and caused the publication of a multitude of writings in Germany for and against the matter, among which the most important is Rauff's "Treatise on the True Nature of the Hungarian Vampire," in which an account is given of all the writings which had appeared on the subject (Leip. 1734).

The name V. has been appropriated to blood-sucking bats. It was erroneously given to bats of the south-east of Asia and Malayan Archipelago, which are really frugivorous. The blood-sucking bats are all South American, and belong to the genus *Phyllostoma*, or SPECTRE BAT (q. v.), and genera nearly allied to it. The true vampires (*Desmodus*) resemble the Spectre Bats; they have a small blind membrane on the nose, no tail, and the inter-femoral membrane little developed. They have two great projecting, approximate upper incisors, and similar lancet-shaped superior canines, all of which are very sharp-pointed, and arranged to make a triple puncture like that of a leech. There are four bilobate inferior incisors, the innermost separated by a wide interval; the lower canines are small; there are no true molars, but two false molars in the upper jaw, and three in the lower, of a peculiar form, apparently unfitted for mastication. The intestine is shorter than in any other mammal, and the whole structure seems to indicate that blood is the sole food. In some parts of South America, vampires are very numerous, and domestic animals suffer greatly from their nocturnal attacks. They seem to take advantage of an existing wound, but they can also make one. In some parts of Brazil, the rearing of calves is impossible, on account of these bats, and there are districts, chiefly those in which limestone rocks prevail, with numerous caves, in which cattle cannot be profitably kept. Vampires sometimes attack men, when sleeping in the open air; but the stories of their fanning their victims with their wings, whilst they suck their blood, are fabulous.

VAN, a fortified town of Turkey in Asia, capital of a district of the same name, stands near the south-east shore of Lake Van, 145 miles south-east of Erzerum. It is overlooked by a citadel, now much dilapidated, but which, from its position on a lofty height, might be of importance, and in good repair, and well defended, would be also almost impregnable. Cotton goods are manufactured, and the bazaars are well stored with the produce raised in the vicinity. The streets are narrow, dirty, and ill-paved, but most of the houses are well-built. The principal public buildings, in addition to the citadel, are the mosques, the Armenian churches, the baths, the caravanseras, and the bazaars. V. is always called among the Armenians Schamiramakert—i. e., Town of Semiramis—contains ancient ruins, and cuneal inscriptions are found in which the name Xerxes frequently occurs. Pop. stated at 45,000.—The district of VAN, a territory of Turkish Armenia, has sometimes been a separate pachalik, and sometimes a subordinate division. It is bounded on the east by Persia, and on the north by the lately acquired Russian possessions in Armenia. It consists mainly of a lofty basin, surrounded by steep mountains, in the centre of which is the Lake of Van. The climate is very hot in the lowlands. The productions are corn, fruit, wine, flax, tobacco, cotton, timber, manna, gall-nuts, and honey. The pasturage being exceedingly good, great numbers of live-stock are reared, and, with the other agricultural products, form the chief exports.—The LAKE OF VAN is a considerable inland sea, eighty miles long and fifty miles in extreme breadth, though the average breadth is not nearly so great. Area, 1900 sq. miles. It is fed by about eight streams, and has no visible outlet. Its waters are salt, and the only fish caught in it are a kind of sardines, which are salted and exported throughout Asia Minor.

VAN, a species of carriage for merchandise, sometimes covered, and in use for carrying household furniture; in other cases, open and of a lighter nature, used by shopkeepers for sending articles to their customers. Whether large or small, or with four or only two wheels, the van is set on springs, and it might be called a spring-cart or wagon. The term van seems to be an abbreviation of caravan, which was formerly in use.

VANA'DIUM, (symb. V, equiv. 51.3), a rare metal of little practical importance. The name was first given to a substance then believed to be an elementary metal, but which has since proved to be a compound. The discovery of the substance was

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ascribed by some to Del Rio in 1801, and by others to Sefström in 1880. The last-named chemist found it in a Swedish iron ore, and gave it the name of V., from *Vanadis*, a cognomen of the Scandinavian goddess Freyja. Roscoe has recently demonstrated that this substance is really a compound of oxygen with a metal, and to this new metal the symbol V is now appropriated. In the light of Roscoe's discovery, the V of the old formula becomes V_2O_3 , and the oxides VO , VO_2 , and VO_3 , become V_2O_3 , V_2O_4 , and V_2O_5 . In very small quantities, V. is present in nearly all clays, but its most abundant source is vanadate of lead, which has been found in Mexico, Chili, and at Wanlockhead in Scotland.

VANBRUGH, Sir John, an eminent architect and dramatist of the 18th c., was the grandson of a Protestant refugee of Ghent, who settled in England during the reign of Queen Elizabeth. V. is supposed to have been born in Chester (in which city his father was a merchant), in the year 1666, and to have been sent to France for his education. His artistic studies were interrupted for some time by his entering the French army, which, however, he left after attaining the rank of captain. On returning to England he must soon have acquired reputation as an architect; for, in 1695, he was made one of the commissioners for finishing the palace at Greenwich for the purposes of an hospital. His first attempt at play-writing was "The Relapse." It was brought out at Drury Lane with such success, and obtained such popularity, that V. ranked ever after as one of the leading wits and dramatists of his day. About 1697, he wrote his famous comedy, "The Provoked Wife," for Lincoln's Inn Theatre, where it was produced with even greater success than that which had attended "The Relapse." He then, in partnership with Congreve, started a theatre in the Haymarket, and there brought out his play, "The Confederacy." But so ill suited was this building for speaking in, that not even the brilliant wit or racy humor of "The Confederacy" could command an audience, and Congreve abandoning the scheme, the theatre had to be closed. In 1702, he erected, for the Earl of Carlisle, the noble palace of Castle Howard, in Yorkshire; and this led to his being employed as the architect of many mansions for the noble and the wealthy in other parts of the country. His reputation was now such that he was commissioned to erect Blenheim House, which the parliament had voted to the Duke of Marlborough; but as no particular fund had been provided for meeting the expenses, and as parliament refused, when applied to, to grant any money for that purpose, the commission was more honorable than lucrative. The queen supplied from her own private purse most of the funds; but after her death, this supply was of course stopped. The Duke of Marlborough having also died, left the specific fund to be expended in meeting the architect's claims; but the duchess not only refused to pay V. his salary, but dismissed him from his office; and the house was completed under some other management, but from the original designs. After a great deal of trouble, V. managed to get nearly all the money that was due to him; but ever after was the sworn foe of the Duchesses of Marlborough. In 1714, he was made Comptroller of Royal Works. V. died at Whitehall on March 30, 1726, leaving his well-known and popular drama, "The Provoked Husband," unfinished. His plays can hardly be said to be popular now, their licentious tone and loose morality preventing their being read to that extent to which the brilliancy of their wit, keenness of their satire, and genuine character of their humor, would otherwise entitle them. They want the polish of Congreve's dramas, yet, at the same time, they are not infected with the artificiality, stiffness, and labored brilliancy which disfigures so many of Congreve's best scenes. The interest is well sustained throughout; the characters—such as they are—are real, natural, and racy; the situations striking, and the dialogue brilliant and unflagging. The best edition of them is contained in Jelfs Hunt's "Comic Dramatists," to which is also prefixed an excellent Life of Vanbrugh. His architectural works are still among the first of their kind—massive, picturesque, varied in outline, and wonderfully skillful in composition, though a frequent carelessness in the management of details spoils some of his best effects.

VANCOUVER ISLAND, now, jointly with British Columbia, one of the colonies of Great Britain, forms a part of the Dominion of Canada, and is bounded on the w. by the Pacific, and on the e. by Queen Charlotte Sound, Johnstone Strait, Discovery Strait, and Strait of Georgia, which, taken together, form an open seaway, separating the island from British Columbia. Lat. $48^{\circ} 20'$ — 51° n., long. 123°

—139° w. It is 270 miles in length, from 30 to 50 miles in average breadth, and is of importance not only for its great natural resources, but also from its geographical position, which gives it, both commercially and in a military point of view, the command of the Pacific. Area, about 16,000 sq. mile. The main mass of the island is a mountain ridge, which rises in its highest peak, Mount Arrowsmith, to the height of 5000 feet, and whose buttress-like walls descend for the most part abruptly to the shore. There are, however, in many coast-districts, especially on the south-eastern and eastern sides, undulating tracts, thickly wooded in general, but here and there containing patches of open grass-land. The outline of the island is boldly picturesque. The shores are marked by abrupt rocky cliffs and promontories, by pebbly beaches and sheltered coves, with fine harbors. The western shores are gloomy and frowning in aspect, deeply indented by fiord-like arms of the sea, the banks of which are formed by steep rocks, rising like walls. The surface is diversified by mountain, precipice, hill, dale, and lake, and the whole country is more or less densely wooded except where the mountain summits afford no foot-hold for plants, or where open grass-lands occur. There are no navigable rivers, and the streams, which are torrents in winter, and are nearly dry in summer, are short, and are valuable only as supplying power for grist and saw mills. Springs are numerous, and the water excellent. The climate closely resembles that of Great Britain, subject, however, to modifications traceable to the position of the island. The ocean that washes its shores is throughout the whole year of a remarkably low temperature, owing to the arctic currents that sweep down along the coast, even to the latitude of San Francisco; and westerly winds, blowing over the chilled sea-water, modify the climate of the island considerably. Again, winds from the south-east, from the snow-covered Olympian Mountains in Washington Territory, are also cold. Owing to these causes, the climate of the island, even so far on as the middle of June, resembles a late English spring—having a clear atmosphere, bright sun, and cold winds. The winter, as a rule, is open and wet; the spring is later and colder than in England, and the summer drier and hotter. The maximum temperature is about 84° Fahr., the minimum about 23° Fahr. Only a small proportion of the surface is suited for agriculture, four-fifths being little better than barren rock. The crops generally raised are wheat, barley, oats, and peas. The green crops are turnips, mangold-wurzel, vetches, potatoes—which flourish here in unsurpassed excellence—and all sorts of vegetables. Of wheat, the average production is 25 to 30 bushels per acre; of oats, 40 bushels; barley, 40 bushels. Fruit-culture is a very profitable branch of industry. Gold has been found; coal is very abundant; and copper, silver, lead, and other ores abound. The puma, the bear, and wolf still range in the forests; two kinds of deer are found; there are two kinds of grouse; and snipe and wild fowl in great variety. Salmon abound. Extensive banks lie about 55 miles off the south-west shore. All of them are well stocked with fish, especially the cod, herring, haddock, whiting, halibut, and sturgeon. A company has been formed to prosecute the fisheries; and there is an extensive market along the west coast of America. Among the valuable woods of the island, the white fir, or Douglas pine, one of the best woods for spars known, is at once the commonest and most important. In some instances, this tree has been known "to square" 45 inches for 90 feet. The cedars have an average diameter of 6 to 7 feet, and one has been measured 14 feet in diameter. Ship-building has sprung up, and is an important branch of industry. The capital of the island is Victoria (q. v.). The pop. (including Victoria) is 6000; together with a large floating pop. of miners, and about 18,000 natives, who, however, are gradually disappearing.

The island was discovered in 1781 by Captain Vancouver, an officer in the British navy. Its possession was secured to Britain by treaty in 1846; previous to 1858, it was held, together with British Columbia, by the Hudson's Bay Company under lease from the crown; later, it was for two years an independent colony; but in 1865, V. I. and British Columbia were united. See COLUMBIA, BRITISH. The Canadian Pacific Railway is to fix its ultimate terminus on V. I., which will thus stand in unbroken communication with the Atlantic coast.

VANDA, a genus of plants of the natural order *Orchidaceæ*. *V. œrulea*, one of the most beautiful of Indian orchids, is highly prized by cultivators in Britain, and plants are sold at prices of £3 and upwards. It has panicles of azure flowers. Dr

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Hooker found it on the Khasia Mountains, growing in great profusion, epiphytically upon the oak, banyan, &c.

VANDALS (Lat. *Vandili*, also *Vindili* and *Vanduli*), a famous race of European barbarians, probably of Germanic, though some consider them of Slavonic origin. Procopius, who agrees with Pliny in considering them one with the Goths, states that they originally occupied the country about the *Palus Mæotis* (Sea of Azov), but it would appear that afterwards they migrated to the north-west, and settled south of the Baltic, between the rivers Vis-tula and Viadus (Oder). They make their first appearance, however, as a historic people in the 3d c. A. D., at which time they inhabited the north-eastern slopes of the Riesengebirge (called after them, *Vandales Montes*), and figure as the associates of the Marcomanni and Quadi in the plundering expeditions into Pannonia, and the wars with Marcus Aurelius. In the latter half of the 3d c., they are found in the Roman province of Dacia, along with Goths and Gepidae. According to Jornandes, the Gothic king, Geberic, annihilated a large part of the nation on the banks of the Maros. The remainder were transplanted by Constantine to Pannonia, where they lived in peace for 60 years. But at the beginning of the 5th c., urged, it is said, by Stilicho, they abandoned their new homes, and in company with the Sævi, Alani, and other German tribes, led by their king, Godigisl, burst into Gaul, which they miserably wasted for the space of three years. Thence they swept through the passes of the Pyrenees into Spain, which experienced a similar fate; and finally, after much quarrelling and fighting with their German associates, they settled in a part of Bætica, which received from them the name of *Vandalitia* (mod. *Andalusia*). In 439, at the call of Boniface, governor of Africa, who, from being the most reliable bulwark which the Western Empire possessed, had been driven into rebellion by the false representations of Aëtius (see VALENTINIANUS III.), they crossed the strait of Gibraltar, under their leader, Genseric (q. v.), in one restless horde (numbering 50,000 to 80,000 in all), carrying devastation and ruin from the shores of the Atlantic to the frontiers of Cyrene. They were joined by the Donatists (q. v.), a sect of African heretics, and being themselves Arius, they inflicted great cruelties upon the orthodox Christians. Meantime Boniface had discovered the treachery of his rival Aëtius, and set himself, when too late, to remedy the dreadful consequences of his too credulous resentment. He advanced with a small and hastily-levied force, but was defeated with considerable loss, and driven into Hippo (now *Bona*), which he defended for more than 14 months. During the siege St Augustine died, August 28, 430. Boniface, reinforced by a Byzantine army under Aspar, now sallied out upon the Vandals, and a second defeat decided the fate of Africa. In 439, Genseric broke the peace which he had concluded with Valentinian III., in 435, and conquered Carthage. A new peace was established, which recognized the authority of the V. over North Africa from the Atlantic to Cyrene, over the Balearic Isles, Sardinia, Corsica, and part of Sicily. In 455, the V. invaded Italy, and plundered Rome for 14 days. The manner in which they mutilated and destroyed the works of art collected in the city, has originated the application of the term *Vandalism* to all similar barbarism. After the death of Genseric (477), his son, Hunneric, cruelly persecuted the Catholics; warred against the Moorish races in North Africa, who were trying to recover their independence, and kept the Mediterranean in a state of alarm by his piracies. His successors, Guntamund (d. 496) and Thrasamund (d. 523), were comparatively mild and tolerant rulers; the latter was even friendly to literature. But the warm climate, and the love of luxurious pleasure, now began to enervate the spirit of the V.; and the natives, in different parts of Africa, shewed unmistakably that they had ceased to fear them. Thrasamund was compelled to solicit aid from his brother-in-law, Theodoric (q. v.), who sent him a Gothic contingent to help him against the Moors of Tripoli. After his death, Hilderic, a son of Hunneric, became ruler, but he shewed such strong leanings towards Catholicism (owing to his long residence in Constantinople), that his subjects grew discontented, and he was overthrown by his uncle, Gelimer, in 530. This led to the Emperor Justinian sending an expedition, under Belisarius, against Gelimer, in 533. When the latter heard of the arrival of the great Byzantine general, he caused Hilderic and his sons to be put to death, but was himself soon after forced to seek refuge in the wilds of Numidia. In 534, he surrendered, was carried to Constantinople

in triumph, and ended his life in Asia Minor. Most of the V. were drafted into the imperial army, and "used up" in the wars with Persia. The few who remained in Africa rapidly disappeared among the natives.—See the various histories of the Roman Empire; also Papencordt, "*Geschichte der Vandal. Herrschaft in Afrika*" (Berl. 1837).

VANDERVELDE, William, commonly called the Elder, in distinction from his son of the same name, was born in 1610, at Leyden. He was bred a sailor; and having a natural aptitude for art, he busied himself in drawings of marine subjects. These becoming known, were seen to be of great merit; and in 1644, he was chosen to sail with the fleet of the famous Admiral de Ruyter, with a view to the commemoration on canvas of his exploits against the English. The sketches which he produced of several engagements which he witnessed procured him a great reputation; and in 1675, he was induced to settle in England, as painter of sea-fights to Charles II., who allowed him a pension of £100 a year. On the death of Charles, his services were retained at the same rate by his successor, James II. He died in London, in 1698, and was buried in St James's churchyard. His works were mostly colorless drawings, of great beauty and precision, many of which were afterwards painted upon in oil by his much more famous son—

VANDERVELDE, William, the Younger, who was born at Amsterdam, in 1633. He received his education in art from his father, whom he followed to England. The designs produced by the father, the son was employed to color; and for this service, to him also a pension of £100 a year was assigned. This official and subsidiary employment was, however, the least important part of his activity, his time being mainly devoted to the series of original works which have given him assured rank as one of the greatest of marine painters. In his rendering of the ocean, in its various moods, V. has had few equals; and his works are now highly valued by the connoisseur. The best of them are to be found in England, the Gallery at Bridgewater House being particularly rich in fine specimens. V. lived for the most part with his father at Greenwich; and after his death, in London, where, in 1707, he died.

VANDIEMEN'S LAND. See **TASMANIA**.

VANDYCK. See **DYCK**.

VANE, Sir Henry, a notable English politician of the 17th c., was born in 1612. His father, also a Sir Henry, was a distinguished statesman in the reigns of King James I. and Charles I., and received many proofs of the royal favor; but having taken part in the prosecution of Strafford (q. v.), he was deprived of all his offices of honor and emolument. When the parliament rose against the king, V. remained neutral; and some time before the execution of Charles, he withdrew to his seat at Itaby Castle, where he died in 1664.—**SIR HENRY VANE**, the Younger, studied at Westminster and Magdalen Hall, Oxford, where he appears to have embraced, with all the inconsiderate enthusiasm of his character, those republican principles for which he afterwards became so famous. His travels in France and Switzerland strongly confirmed him in his aversion to the government and discipline of the Church of England, and in 1635, he sailed for New England—the refuge of disaffected spirits in those days. He was soon after chosen by the people governor of Massachusetts; but his predilections in favor of "Antinomian" opinions soon robbed him of his popularity, and in 1636, or thereabouts, he returned home. He now married a daughter of Sir Christopher Wray of Ashby, in Lincolnshire, and entered on a political career. Through his father's interest, he was appointed treasurer of the navy, along with Sir William Russell, and entered parliament for Kingston-upon-Hull, in 1640, but almost immediately joined Pym and the anti-court party, of which he became one of the most vehement and resolute leaders. When the Civil War broke out, no man was more conspicuous in the military and theological politics of the time than Vane. He carried to the House of Peers the articles of impeachment against Archbishop Laud; he was a member of the Westminster Assembly; a "great contriver and promoter of the Solemn League and Covenant" (though in his heart he abhorred both it and presbytery, and only used them as a means of crushing the bishops); the chief instrument in carrying the "self-deceiving ordinance" (1644); and one of the commissioners at the treaties

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of Uxbridge (1644—1645) and the Isle of Wight (1648). But he did not view with satisfaction the increasing power of Cromwell and the army. He was too extravagant a parliamentarian, too much of a visionary and enthusiast; to be pleased with the supremacy of the musket and sabre, and for some time he withdrew altogether from public affairs. On the establishment of a Commonwealth, however, in February 1649, V. was appointed one of the Council of State; yet his antipathy to Cromwell, and his factious, pragmatical, hair-splitting activity so much increased, that the former, who looked upon V. as a subtle promoter of divisive courses, called him a "juggling fellow;" and was probably in deep earnest, when, at the dissolution of the Commons, in April 1653, against which V. protested with a sort of feminine sharpness, he cried out: "The Lord deliver me from Sir Harry Vane!" In 1656, V. wrote a book, entitled "A Healing Question Propounded and Resolved," which was so hostile to Cromwell's protectorate, that it was found necessary to imprison the author in Carisbrooke Castle, Isle of Wight. He was released after a detention of four months; and attempts were made by Cromwell to win him over, but V. was inflexible in his fanaticism; and during the rule both of Cromwell and Richard, he maintained an attitude of pullen discontent. After meddling a little in the helpless intrigues that followed the abdication of Richard, he was ordered by parliament to withdraw to his house at Raby. When the Restoration took place, V. was one of the twenty persons excluded from the *Act of General Pardon and Oblivion*; and in July 1660, he was committed to the Tower. On the 2d of June 1662, he was arraigned, and indicted of high treason before the Middlesex grand jury, found guilty (on the 6th), and on the 14th was beheaded on Tower Hill. His son was knighted by King Charles, and raised to the peerage by King William, as Lord Barnard of Barnard Castle. V. was a subtle, restless, crotchety, unwise kind of man—a real thorn in the flesh of the great Cromwell. He was one of the Fifth Monarchy Sect, and much given to extravagant religious musings, and to prying (with his friends) in language wholly unintelligible. He also wrote several political and theological treatises, which do not require special mention.—See "The Life and Death of Sir Henry Vane, Knight" (London, 1662); Birch's "Lives;" and Ludlow's "Memoirs."

VANGS, ropes on either side of a gaff, for steadying, or acting as braces to, a fore-and-aft sail.

VANILLA, a genus of parasitical *Orchideæ*, natives of tropical parts of America and of Asia; which spring at first from the ground, and climb with twining stems to the height of 50 or 80 feet on trees, sending into them fibrous roots produced from nodes, from which the leaves also grow. These roots, drawing sap from the trees, sustain the plant, even after the principal root has been destroyed. The stem is four-cornered and juicy; the leaves long and fleshy. The flowers are in spikes, and are very large, fleshy, and generally fragrant. The fruit is a pod-like, fleshy capsule, opening along the side. The *Vanilla* of commerce was formerly supposed to be the fruit of *V. aromatica*, a native of tropical America, but is now ascertained to be chiefly, if not wholly the fruit of *V. planifolia*, a species indigenous to Mexico, Guiana, Brazil, Peru, &c., and cultivated also in some of the West India Islands, the Mauritius, and Ceylon. The fruit is cylindrical, about a span long, and less than half an inch thick. It is gathered before it is fully ripe, dried in the shade, and steeped in a fixed oil, generally that of the cashew nut. It contains within its tough pericarp a soft black pulp, in which many minute black seeds are embedded. V. appears in commerce in packets of 50—100 pods, wrapped up in cane-leaves and sheet-lead, or in small tin boxes. It has a strong, peculiar, agreeable odor; and a warm, sweetish taste. The interior pulp is the most aromatic part. Benzoic acid is sometimes so abundant in it as to effloresce in fine needles. V. is of little use in medicine, although it is a gentle stimulant and promotes digestion, and in large doses is said to be a powerful aphrodisiac; but it is much used by perfumers, and also for flavoring chocolate, pastry, sweetmeats, ices, and liqueurs. Balsam of Peru is sometimes used as a substitute for it, as it is expensive, and the whole quantity imported into Britain does not exceed four or five cwt. annually. It is in very general use in South America. Several kinds are distinguished in commerce. The best is that called *Leg* or *Lee*, which is almost of a black color, and covered with crystals of benzoic acid. Another kind, less fragrant, drier, and of a darker color, is

known as *Simarona*. A still inferior kind, with much broader, brown capesles, is called *Pompona*, or *Boca*. When the fruit of *V.* is fully ripe, a liquid (*Baume de Vanille*) exudes from it, which is unknown in Europe, but is valued in Peru. *V.* has ripened its fruit in British hot-houses, but the flowers are apt to fall off without fruit being produced, unless care is taken to secure it by artificial impregnation. This is, in some measure, the case even in the East Indies, and in some parts of America itself: and it is supposed that the presence of some insect, delighting in the flowers of the *V.*, makes it more productive in other parts of America, especially in Mexico.

VANLOO, Jean Baptiste, a member of a family originally Flemish, in which a love of art seemed indigenous, was born at Aix in Provence in 1684. His grandfather and father were both painters of some talent, and under the instruction of the latter, whilst yet a mere boy, he is said to have attained considerable proficiency as an artist. Subsequently, he settled himself as such at Nice, and afterwards at Toulon, where he married the daughter of an advocate. On quitting Toulon, on the occasion of its being besieged by the Duke of Savoy in 1707, he returned to his native place, and abode some years there. He was again at Nice in 1712, and in the year following he visited Genoa and Turin. At the latter of these cities, he won the favorable regard of the Prince of Carignano, son-in-law of the Duke of Savoy, and was sent by him to study at Rome as a pupil of Benedetto Luti. After a further residence at Turin, he proceeded in 1719 to Paris, where apartments were assigned him in the hôtel of the prince his patron. Here he speedily acquired a great reputation as a portrait-painter. He was made a member of the Academy in 1731, and Professor of Painting in 1736. The loss of a large sum of money in the Mississippi Scheme induced him to come, in 1738, to London, where his portraits soon distanced all rivalry. His health, however, having given way, he retired in 1743 to his native district, Provence, where he died in April 1746.

Though chiefly eminent in portrait, *V.* had also considerable talent as a painter of historical subjects, and executed many works of this kind, in some of which a distinct merit is still recognised.

VANLOO, Charles André, younger brother of the preceding, was born in 1705, at Nice. As a boy, he was with his brother at Rome, and studied under Benedetto Luti. He accompanied his brother in 1719 to Paris, where, after some little interval in which he was employed as a decorative artist at the Opera-house, he betook himself to portrait-painting. He returned in 1737 to Rome, and there he executed some works which laid the basis of his future reputation, procured him, through the influence of the Cardinal de Polignac, a pension from the king of France, and in 1739, the title of Cavaliere from the pope. On leaving Rome, he visited Turin, painted there for the king of Sardinia a series of subjects from the "Jerusalem Delivered" of Tasso, and returned to Paris in 1734. The year following, he was made a member of the Academy, and his subsequent career was one of full prosperity. Tempting offers were made him by Frederick the Great, who desired to have him in his service; but he declined them in favor of a nephew, preferring to remain in Paris. In 1751, he was made by Louis XV. a knight of the order of St Michael; and in the course of the same year, he became Director of the Academy. In 1763, he was made chief painter to the king; and three years after he died. As the last really great specimens of the old French school of historical painting, his works have still their admirers.

VANNES, a seaport town of France, capital of the dep. of Morbihan, stands at the mouth of the Vannes, which falls into a narrow inlet of the Gulf of Morbihan, 210 miles west-south-west of Paris by railway. The town is surrounded by high walls flanked with towers. The cathedral is the most important edifice. Manufactures of linen and woollen cloth and ship-building to some extent are carried on, as well as commerce in honey, wax, wine, and hemp. Pop. (1876) 15,716.

VAN RENSSELAER, Stephen, known as "the Patroon," an American statesman, and patron of learning, was born in New York, Nov. 1, 1690, the fifth in descent from Killen Van Rensselaer, the original patroon or proprietor of the Dutch colony of Rensselaerwick, who in 1630, and subsequently, purchased a tract of land near Albany, 48 miles long, by 24 wide, extending over three counties. He was educated at Princeton and Harvard Colleges, and married a daughter of General Philip Schuyler, a distinguished officer of the Revolution. Engaging early in politics, at a

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period when they were the pursuit of men of the highest social position, he was, in 1789, elected to the state legislature; and in 1796, to the state senate, and became lieutenant-governor, president of a state convention, and canal commissioner. Turning his attention to military affairs, he was, at the beginning of the war of 1812, in command of the state militia, and led the assault of Queenstown; but the refusal of a portion of his troops, from constitutional scruples, to cross the Niagara river, enabled the British to repulse the attack, and the general resigned in disgust. As president of the board of canal commissioners for 15 years, he promoted the New York system of internal improvements; as chancellor of the state university, he presided over educational reforms; and as president of the agricultural board, aided to develop the resources of the state. At his own cost, he employed Professors Eaton and Hitchcock to make agricultural surveys, not only of his own vast estates, but of a large part of New York and New England, the results of which he published in 1894; he also paid Professor Eaton to give popular lectures on geology through the state. In 1824, he established at Troy an institution for the education of teachers, with free pupils from every county. Widening the sphere of his political interests, he went to Congress in 1828, and served several terms, exerting a powerful influence, and securing the election of John Quincy Adams as President of the United States. After an active, useful, and honorable career, worthy of his high position, he died at Albany, January 26, 1859.

VAN VEEN, Otho (called also OTTOVENIUS), an eminent painter, was a native of Leyden, of which city his father was a wealthy burghmaster. The exact year of his birth is involved in some obscurity; but there seems tolerable evidence to fix it as about 1556—1557. He received a careful education, and in aid of the natural talent he displayed for drawing, the best masters were procured him. When about 15 years old, he was sent to Liège, whence, after a residence of three years, he proceeded to Rome, where he became pupil of the celebrated Zuccheri. In Italy, he remained about eight years; and on his return home by way of Vienna, the emperor, by tempting offers, vainly endeavored to detain him in his service. It is significant of the estimation in which he had come to be held as an artist, that on his passing through Munich and Cologne, similar offers were pressed upon him. These, also, however, he declined, wishing to settle in his native country. Finally, he went to reside at Brussels, as painter to the famous Alexander Farnese, Duke of Parma, and then governor of the Spanish Netherlands, of whom he executed a masterly portrait in armor, which greatly increased his reputation. The duke having died, he established himself at Antwerp, and opened an Academy, at which the great Rubens was one of his pupils. In the matured art of Rubens, traces of his master are still, it is thought, to be detected; and in particular, he is held to have in all probability derived from him that fondness for allegorical and emblematic subjects which possessed him not always to his advantage. On the occasion of the entry into Antwerp of the new governor, the Archduke Albert of Austria, Van Veen was employed to design the arches and the other decorative business of the ceremonial, and so pleased was the duke with the taste and invention displayed, that he appointed him Master of the Mint at Brussels, to which city he returned to reside. An invitation to Paris was subsequently sent him by Louis XIII., but this he saw fit to decline; and in Brussels, at the age of 78, he died.

The chief works of Van Veen are religious pictures for churches. In the cathedrals of Leyden, Antwerp, and Bruges, good specimens may be found. On their own account, they deserve attention; but it is chiefly as "the work of a man who had the honor to be the master of Rubens" (to quote the words of Reynolds), that they now for the most part receive it.

VAPOR. As all *solids*, with the exception of carbon (an exception most probably due to our not being able to produce a sufficiently high temperature), are melted, or rendered *liquid* by the application of Heat (q. v.), so a further application of heat converts them into *vapor*. A vapor is really a gas, but it requires a little consideration to convince ourselves of the fact. Perhaps the best proof that can be given is that supplied by the beautiful experiments of Faraday (q. v.) and others on the liquefaction of gases. Hydrogen, oxygen, and nitrogen were for long exceptions; but now all gases have been liquefied by a proper application of pressure or cold, or of cold and pressure combined. The difference, in common language only, between

a vapor and a gas is this: A gas is a substance which, at ordinary temperatures and pressures exists in a state of vapor; while a vapor is produced by the application of heat to a substance which is ordinarily found in the solid or liquid form. In other words, gases are the vapors of substances which, in the liquid form, boil at very low temperatures.

The most familiar instance of vapor is aqueous vapor, or Steam (q. v.). At all temperatures, even as low as the freezing-point, ice and water give off vapor; and the quantity produced is determined by the temperature alone: that is, Evaporation (q. v.) at any temperature continues (more or less slowly according to the quantity of air or other gas which is present) until the pressure exerted by the vapor upon the containing vessel attains a certain definite value, depending on the temperature alone. If the temperature be such that the corresponding vapor-pressure is equal to the pressure of the air, vapor comes off freely, and we have the phenomenon called boiling.

Vapor in a vessel which contains some unevaporated water is thus always saturated, as it is called, i. e., the full amount of vapor capable of existing at the temperature of the vessel is present. If it be compressed, some is liquefied; if allowed to expand, more vapor is formed.

If, however, there be no water present in the liquid form, and the temperature be gradually raised, the pressure of the vapor will rise, but much more slowly than when water is present, because no more vapor can be formed. In this state, that of *superheated steam*, vapor behaves almost exactly as an ordinary gas.

Chlorine, carbonic acid, sulphurous acid, &c., thus exist at ordinary temperatures as *superheated vapors*; and can therefore be reduced by cold and pressure to the condition of *saturated vapor*, when they are easily liquefied by carrying the process further.

Aqueous vapor may be liquefied by cold alone, or by pressure alone, as we have seen; and at ordinary temperatures, it is easy to liquefy sulphurous acid, ammonia, and even carbonic acid and laughing gas, by mere compression. Gases absorbed by charcoal, or by spongy platinum, i. e., condensed by intense molecular forces on the large surface presented by the interstices in these bodies, must in all probability exist in the state of liquids. Carbonic acid is liquefied when exposed to a pressure of 25 atmospheres at ordinary temperatures; and some varieties of charcoal absorb from 80 to 100 times their bulk of this gas. Remembering that, on account of the impenetrability of matter, the gas can only be in the pores of the charcoal, and that their whole bulk forms but a small fraction of that of the charcoal itself, we see that in all probability the absorbed gas must be condensed so enormously as to have become liquid. It is probable that in Graham's recent process, for separating by dialysis (see Osmosis) the oxygen and nitrogen of the atmosphere, the film of vulcanised india-rubber which is employed as septum compels these gases to pass through its pores in a liquid form.

Some extraordinary experiments, due to Cagniard de la Tour (the inventor of the *SIRENA*, q. v.), have given us valuable information on the subject of vapors. He showed that when water, ether, and other liquids are hermetically sealed in glass tubes, so as to fill from a quarter to a half of the tube, the application of the requisite amount of heat is sufficient to convert the whole into vapor. This vapor, therefore, has a density equal to half or quarter of that of the liquid! Ordinary steam from boiling water has only about 1-1700th of the density of water (in common language, a cubic inch of water gives a cubic foot of steam). These experiments are very dangerous.

Some important experiments of this nature are due to Andrews. Having, by mere pressure, partially liquefied carbonic acid in a glass tube, he raised the temperature gradually, and observed that the demarcation between the liquid and the gas became less and less definite; the capillary curvature of the surface of the liquid also diminishing. At about 88° F., the liquid surface became horizontal, and the liquid disappeared. The tube then appeared to be filled with a homogeneous substance, neither gaseous nor liquid! apparently a new state of matter. When the temperature was slightly diminished, or the pressure relaxed, there was a singular appearance of flickering stripes, such as one sees on mixing alcohol and water, or on looking through the column of irregularly heated air rising from a hot body. No pressure that Andrews could apply not even 400 atmospheres, could liquefy this gas

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when its temperature was above 38° F. It appears that for every gas there is a point of temperature above which it is impossible by any amount of pressure to liquefy it.

The so-called permanent gases, oxygen, hydrogen, and nitrogen, have at last yielded to the patience and skill of M. Pictet of Geneva and M. Cailliet of Paris, and have been liquefied or even solidified. In the last months of 1877 oxygen was liquefied under a pressure of 500 atmospheres; hydrogen, when subjected to a pressure of 230 atmospheres; and nitrogen, under a pressure of 200 atmospheres.

VAR., a department in the extreme south-east of France, bounded on the s. and s.e. by the Mediterranean, and on the n.e. by the department of Alpes Maritimes. See ALPES MARITIMES. Area, 2348 sq. m.; pop. (1876) 295,763. The dep. receives its name from the river Var, which formerly served as its boundary on the east, but which, since the arrondissement of Grasse was taken from the dep. of Var, and added to that of the Alpes Maritimes, now belongs entirely to the latter. Var is well watered by a great number of streams, of which the chief are the Gapau, Argens, and Blanson. In the north and north-east, it is mountainous, being traversed by a branch of the *Alpes de Provence*, called the *Monts de l'Estrel*. Between the mountains and the water-courses are many very fertile valleys. The climate of Var, tempered by the altitude of the surface, is pleasant. Fruits of all kinds are here cultivated with remarkable success; tobacco is grown, and 17,600,000 gallons of wine are produced annually. The dep. abounds in minerals; an active commerce is carried on, the exports being chiefly wine, fruits, olive oil, and other agricultural and horticultural products. It is divided into the three arrondissements of Draguignan, Brignoles, and Toulon. Capital, Draguignan.

VARANGIANS (Ger. *Warder*, or *Wäringer*), a Norman people of the Baltic coast, who greatly damaged by their piracies the commerce of the republic of Novgorod, and subjugated repeatedly the Slavic and Finnish peoples of Northern and Central Russia. They forced the Krivitches, Tschudes, and other tribes to pay tribute, and wrested from the Russians the districts now known as Revel, Petersburg, and Archangel; the Russians retreating into Finland and Karelia. Gradually the two nations became intermixed, and towards the 9th c., the names Russian and Varangian appear to have been considered synonymous. In 862, the rulers of this Russo-Varangian nation, Rurik (q. v.), Sineus, and Truvor, were invited by the federative state of Novgorod, in which the Slaves were dominant, to put themselves at its head, and Rurik accepting the invitation, founded the Russian monarchy. See RUSSIA. The V. were at first distinguishable in various ways above the other peoples of the Novgorod state; but being far inferior in number, were soon forced to adopt the Slavic tongue, conform to Slavic manners, and so become merged in the predominant population. The great success which attended this experiment of the Novgorod confederacy, induced other Slavic states which were located on the Dnieper to put themselves under the protection of the warlike V.; and accordingly we find, soon after 862, a second Slavic state at Kiev, under the rule of Oskold, a Varangian chief, and the conqueror of the barbarous Chazars. After Rurik's death, his successor in power, the Regent Oleg, united Kiev to Novgorod, making Kiev the capital—a position it held till supplanted by Moscow (q. v.).

VARANIDÆ, a family of Saurian reptiles, having a very elongated body, without a dorsal crest; strong legs, and long unequal toes; the tail long and slightly compressed; the scales tuberculous, and arranged in rings; the tongue protractile, dividing into two points as in serpents. Some of them are aquatic, and some inhabit dry and sandy places. The terrestrial species have the tail conical; the aquatic species have it compressed and often crested, so that it becomes a powerful organ of locomotion in water. The motion of the terrestrial species is aided by the tail, and is always serpentine. Some of the V. attain a large size. They feed on animal food of any kind, and have been seen to attack a young deer swimming across a river. The species are not numerous, and belong chiefly to the eastern hemisphere.

VARA'ZZE, a small town of Northern Italy, on the Gulf, and 18 miles south-west of the city of Genoa. Some trade in wool and extensive construction of fishing-boats are here carried on. Pop. of town 5000.

VA'REC, an old name for crude carbonate of soda.

VARE'SE, a town of Northern Italy, in the province of Como, and 18 miles west of the town of that name. It is a handsome town; contains a number of fine palaces and magnificent villas; and carries on manufactures of silk, cotton, paper, and hats. Pop. 12,600. V. is of very ancient origin. The Romans kept it strongly garrisoned as a stronghold against invasion from the north.

VARIA'TION, in Music, a transformation of a melody by melodic, harmonic, contrapuntal, and rhythmic changes. The subject chosen is called the theme; it is first simply harmonised with or without an introduction, and then repeated in a variety of different transformations, and the variations collectively with the theme constitute the piece. Occasionally, the different variations are combined by an intermediate passage; but generally each has its separate close, and the whole terminates with an extended and richly-developed variation, or a coda.

VARIATION OF THE COMPASS. See **TERRESTRIAL MAGNETISM**.

VARICE'LLA (Lat., a little pimple), popularly known as **CHICKEN-POX** (q. v.)

VARICOCE'LE (known also as **CIRCOCELE**) is a term used in Surgery to designate a varicose state of the veins of the spermatic cord. It is caused by the same conditions which give rise to Varicose Veins (q. v.) elsewhere—viz., weakness of structure, combined with obstruction through corpulence, constipation, etc., to a return of the venous blood. For a description of its symptoms, and of the suitable treatment, we must refer to any ordinary text-book of Surgery.

VARICOSE VEINS. When a vein becomes dilated at a certain part of its course, for no apparent physiological object, such as relieving the venous circulation elsewhere (as, for example, in the case of the superficial abdominal veins enlarging in order to relieve a compressed vena cava), it is said to be varicose, the actual dilatation being called a *varix* (a word used in this sense by Cicero and Celsus). Some veins seem to be unaffected by varices, which, however, are of common occurrence in the sub-mucous veins of the rectum (constituting hæmorrhoids or piles), in the spermatic veins, giving rise to Varicocele (q. v.), and in the veins of the lower extremities. They are occasionally (but very rarely) found in other veins. Certain conditions of the system favor the formation of varices, amongst which may be noticed an indolent temperament, and a debilitated condition of the general system, accompanied by a relaxed state of the walls of the veins; and possibly also a congenital predisposition or hereditary tendency. Persons with such a predisposition are more likely to suffer from this affection if their occupation is one which involves much standing or walking; and cooks, washer-women, and foot-soldiers have been selected as specially prone to varicose veins. Varices may occur at almost any period of life, but are chiefly developed during middle age. Their formation is aided by any condition of the system which impedes the circulation, as certain diseases of the heart, lungs, and liver; and by continued *high living*, which is especially liable to induce hæmorrhoids. From the researches of Andral, it appears that in varicose veins the coats of the dilated vessels may become thickened or may become thin; that they may be lengthened so that the veins become tortuous; and that the dilatation may be unequal, giving rise to the formation of pouches; and that, in consequence of the enlarged caliber of the vessels, the veins only act imperfectly, and gradually undergo degeneration. Varices occurring in the leg, to which our remaining observations apply, commonly give rise to deep-seated aching pains in the limb, with a sense of weight, fullness, and numbness, before there is any external appearance of the affection. In a more advanced stage, the ankles swell in the evening, and the feet are always cold. After a time, a small tumor of a bluish tint appears, which disappears on pressure, but returns on the removal of the pressure, and is caused by a dilating vein. This dilatation extends, and forms knotty, irregular tumors, soft to the touch, diminishing on pressure, or on the patient's assuming a horizontal posture, and giving a bluish tint to the adjacent skin. These tumors commonly occur in the middle of the leg, along the track of the saphena veins, but they often extend along the whole of the leg and thigh. With regard to treatment, it may be mentioned that old varices cannot be cured, except by operations dangerous to life, although much may be done for their relief. In their earlier stages, they are, however, more amenable to treatment. As

the disease is a very common one, we shall enter somewhat in detail into the palliative treatment which any one may adopt for himself. The venous circulation of the limb should be as much as possible facilitated by the disease of garters; by keeping the limb (if the means and condition of the patient permit it) in a horizontal position for a month or six weeks; by prohibiting walking, and allowing only carriage-exercise, with the leg elevated to the horizontal position. The limb should also be carefully bandaged from the toes to above the knee, the bandage being replaced daily, and the limb then well rubbed with the hand, or with a flesh-brush, for ten minutes or more, from below upwards, so as to stimulate the circulation. When the circumstances of the patient hinder this treatment, elastic stockings may be tried during the day, or ordinary bandages, with a pad of lint placed on each varicose cluster before the bandage is applied. In cases where only one or two trunks are affected, the disease may be prevented from extending by the application of pieces of wash-leather spread with soap-plaster firmly over them. At the same time, the general health must be attended to. Ill-nourished, feeble patients must be treated by tonics and nourishing diet; while over-fed, plethoric patients require mild but often repeated purgatives to relieve the portal circulation. In the numerous cases in which there is a relaxed condition of the veins, the tincture of sesquichloride of iron may usually be given with advantage in half-drachm doses thrice daily in half a tumbler of water, with a colocynth pill every second night, to obviate the constipating action of the iron. Amongst the means of effecting a *radical cure*, by causing coagulation of the blood in the dilated veins, when they shrink and contract permanently, are (1) caustic potash applied over the course of the vessel, (2) subcutaneous incision of its walls, and (3) compression of the vessel between a steel pin and a twisted suture. We believe that the cases are rare in which the pain of the varix is so great as to disqualify a patient from his ordinary work, and these are the only ones in which any of these operations should be recommended; "and the patient," says Mr Callender, "if wise, will be contented with the palliative measures of a more simple character."—Holmes's "System of Surgery," vol. iii. p. 321. Amongst the troublesome consequences of varicose veins are the obstinate ulcers, known as varicose ulcers, to which they give rise; and it must be borne in mind that occasionally, when the skin gets thinned by prolonged pressure, the varices burst through it, and give rise to hæmorrhage, which, if not promptly stopped, may cause fainting, and even death. When such an accident occurs, the patient should at once be placed in a horizontal position, and the leg raised, in which case the bleeding will probably cease. If it continue, a pad of lint must be pressed upon the mouth of the bleeding vessel by means of a few turns of a bandage round the limb.

VARIETY, in Natural History, a term employed to designate groups subordinate to Species (q. v.). Varieties are regarded as less permanent than species; and those who regard species as perfectly distinct in their origin, look upon varieties as modifications of them due to particular causes. Of course those who adopt Darwin's view of species do not deem the distinction between species and varieties so important, but rather consider varieties as species of formation. However this may be, all naturalists acknowledge a difficulty of deciding what are varieties and what are species; and some reckon as varieties what others regard as distinct species. The whole subject is involved in difficulty, and must be studied both with respect to general principles, and to the peculiarities of particular cases. Whatever theory may be adopted, many of the groups now distinguished by particular names are doubtful, and their designations must be regarded as merely provisional. It cannot be certainly said whether they are varieties or species. The term *Variation* has been employed by some authors to designate forms less permanent than varieties, but the term has not obtained general acceptance.

VARIÑAS, a town of Venezuela, on the San Domingo, 90 miles south-east of the nearest shore of Lake Maracaybo. It stands at the entrance to a valley covered with tobacco-plantations. V. carries on a trade in tropical productions and in cattle. Pop. stated at 5000.

VARIOLA. See SMALLPOX.

VARIX. See VARICOSE VEINS.

VARNA, an important seaport of the principality of Bulgaria, on the northern side of a semicircular bay, an inlet of the Black Sea, 180 miles north-west of Constantinople. The Congress of Berlin in 1878 decided that the strong fortifications by which the port was formerly defended should be destroyed. V. stands on a sandbank, and the city wall, the base of which in some places is 20 or 30 feet above sea-level, is in other places on a level with high-water. The town itself is crooked, irregular, dirty, and dilapidated, and as viewed from the sea, it presents a huge jumble of red-tiled houses, interspersed here and there with mosques and minarets. Pop. 26,000. The allied French and British troops were here encamped for some time in 1854. Though the harbor of V. is exposed, a considerable trade is carried on, the value of the year's imports amounting to about £450,000, and of the exports to about £540,000.

VARNISH is a solution of some resinous material in any proper solvent, alcohol and oils being the ones chiefly employed. The solution must be of such consistency as to enable it to be very thinly and smoothly spread over the surface intended to be varnished, so that when it dries, it leaves a thin resinous coating, which is either naturally glossy, or can be made so by mechanical polishing. From the extremely inflammable nature of the material employed, the preparation of varnish is extremely dangerous, and should not be attempted except in premises specially adapted for the purpose, and with skilled workmen. The resinous gums, such as copal, anime, and mastic, and the various kinds of lac, are those chiefly used; the copals and anime are employed in making the oil-varnishes, and the lacs and gum-mastic for spirit-varnishes. Heat is required with both kinds of solvents, and it is obtained by hot-water baths as a means of safety. Coloring matters are added to some varnishes, especially to those used on metal, as the lacquer varnish used to protect the polished surface of brass, which is colored with gamboge and turmeric. Saffron, aloes, dragon's-blood, and asphalt are also used to give yellow, brown, red, and black colors.

VARNISH TREE, a name given to several trees of the family *Anacardiaceæ*, the resinous juice of which is used for varnishing or for lacquering. The **BLACK V. T.** (*Melanorrhæa ustata*) is described in the article **MELANORRHÆA**; the **JAPAN V. T.** (*Rhus vernicifera*) in the article **SUMAC**. Another tree, valuable for the varnish which it yields, is *Stagmaria verniciflua*, a native of Java, Sumatra, Borneo, Celebes, and other East India Islands. The juice is extremely acrid, and soon hardens into a black resin. To obtain it, pieces of bamboo are inserted into the bark, and allowed to remain all night, as the juice flows more freely by night than by day. It sells at a high price. It is prepared for use by boiling it with equal parts of oil, obtained from the fruit of the *Mimusops elengi*. The exhalations of the tree are said to be very noxious.

VARRO, "the most learned of the Romans," so called from his vast erudition in almost every department of literature, was born 116 B.C., and educated first under L. Ælius Stilo Præconinus, and then under Antiochus, a philosopher of the Academy. V. served with distinction in the wars against the Mediterranean pirates and Mithridates; but afterwards as legate of Pompey in Spain, he was compelled to surrender his forces to Cæsar. He continued to share the fortunes of the Pompeian party till its defeat at Pharsalia, after which he solicited and obtained his pardon from Cæsar, by whom he was employed to collect and arrange the great library designed for the public. The next period in V.'s life was spent in literary retirement, chiefly at his villas near Cumæ and Tusculum. When the 2d triumvirate was formed, his name was enrolled in the list of the proscribed; but he succeeded in escaping, and, after some time spent in concealment, he was received under the protection of Octavian. The residue of his long life was spent in the tranquil prosecution of his favorite studies, rendered all the more arduous by the destruction of his magnificent library. He died in his 89th year, 23 B.C. V. was not only the most learned, but also the most prolific of Roman authors. He himself confesses to having composed no fewer than 490 books; but only two of these have survived, and one of them in a fragmentary state. The most considerable of his writings, whether lost or extant, are as follows: 1. "De Re Rusticâ, Libri III.," still extant, and though written in the author's 81st year, constituting the most important treatise on ancient agriculture known to us. 2. "De Lingua Latinâ," a grammatical work, which originally extended to 24 books, only six of which, however, have come down to us, and even

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these in an imperfect form. But for this treatise, mutilated as it is, we should be ignorant of many terms and forms, as well as of much recondite information regarding the civil and religious usages of the ancient Romans. 3. "Sententie," consisting of 165 pregnant sayings strung together, not by V. himself, but probably by different hands at different times. 4. "Antiquitatum Libri," comprising two sections, the "Antiquitates Rerum Humanarum," in 25 books, and the "Antiquitates Rerum Divinarum," in 16 books. This, the greatest work of V., and on which his reputation for learning was mainly founded, has unfortunately perished, all but a few fragments. From the 2d section, St Augustine drew much of his well-known work, the "City of God." 5. "Saturne," composed in various metres, and occasionally in prose. These pieces, copied to some extent from the productions of Menippus the Gadarene, were apparently a series of comments on a great variety of subjects, generally conveyed in the form of dialogue, and aiming at the enforcement of some moral lesson or serious truth in a familiar and even jocular style. Of these we have only fragments; and of the other works little more than the titles. The best edition of the "De Re Rustica" is that of Schneider (Leip. 1794—1797); of the "De Lingua Latina," that of Müller (Leip. 1833).

VARUN'A (from the Sanscrit *vr't*, surround; hence, literally, "the surrounder," and kindred with the Greek *Ouranos*) is, in the Vedic Mythology of the ancient Hindus, one of the *Adityas*, or offsprings of *Aditi*, the deity of space, and amongst these, one of the most prominent. He is often invoked together with *Mitra*, sometimes together with *Agni*, the god of fire, or with *Indra* (q. v.), or other elementary deities; but frequently he is also separately praised by the poets of the Vedic hymns. The character of V., as is the case with other Vedic deities, does not appear to have been or remained the same throughout the whole period represented by the Vedic poetry, but, on the contrary, to have varied according as new imaginations were connected with the idea out of which he arose. Originally, *Varun'a* seems to have been conceived as the sun from the time after its setting to that of its rise; while *Mitra* probably represented the sun at its rise. The night is therefore said to be V.'s, and the *Mitra*'s; and the "ever-going *Varun'a* grants a cool place of rest to all moving creatures, on the closing of the eye (of *Savitri*, the sun)." As a consequence, the sun, as manifest during its daily course, is spoken of as his infant, and he "prepares a path for the sun;" and the dawn, which is called the golden light of *Mitra* and V., "goes before *Varun'a*." Out of the mysteriousness with which night is easily endowed, and the qualities which imagination may ascribe to the luminous origin of V., then probably grew the moral attributes given to this deity; for he is extolled as the guardian of immortality; as the cherisher of truth; as armed with many nooses, with which he seizes evil-doers; as the forgiver of sins, and as having unlimited control over mankind. "No one rules for the twinkling of an eye apart from him," and he witnesses man's truth and falsehood. The functions of sovereign authority which are then also attributed to him are probably a consequence of his character as protector of the good, and punisher of the wicked; but his kingly might is, in some hymns, also associated with the power, predicated of him, of "setting free the water of the clouds," or of "ruling over the waters that are in heaven and earth." Whether the connection of V. with the element of water arose from the association of moisture with night, or, which is more likely, from the notion, that water (*vâri*, from the same radical, *vr't*, as V.) envelops or surrounds the earth, as darkness does, may be doubtful; but it is worthy of notice that the passages of the *R'igveda* in which V. is spoken of as the cause of rain, or as the lord of rivers or the sea, are few, and perhaps do not belong to the earlier portion of *R'igveda* poetry. See, for more detail, J. Muir's "Contributions to a Knowledge of the Vedic Theogony and Mythology," in the "Journal of the Royal Asiatic Society" for 1864. Compare also the article *VASISHT'HA*.—It is in this latter character alone, however, that V. appears in the classical and Puranic mythology; for there he has ceased to impersonate the sun, when invisible, and though, at that period too, he is still mentioned as an *Aditya*, his real quality is that of the regent of the waters, and more especially of the ocean, personified. As such, he retains, it is true, the Vedic qualities as "lord of punishment," and carries the "noose" to bind the wicked with; these attributes, however, are, then, not the reflex of his solar omniscience and power, but that of his might as the god of water.—Later fiction makes him also the regent of the west, probably in recol-

lection of his Vedic character as the setting sun; and endows him with a wife, *Varu-
s'ant*, a son, *Pushkara*, and sometimes also with a daughter, *Punjakaethak*. It further gives him for a residence the fabulous mountain, *Pushpagiri*, "the mountain of flowers," and a marine monster, *Makara*, for his vehicle.

VARUS, Publius Quintilius, a Roman of noble birth, was appointed governor of Syria, and on his return from that post, was sent by Augustus to command the armies of Germany. His instructions, also, were to introduce into that country the regular administration of a Roman province. The Germans were indignant at his proceedings, and under the leadership of a chief of the Cherusci, named Arminius (Latinised from Herman), attacked V., who, with three legions, the usual number of auxiliaries, and a strong body of cavalry, had proceeded as far as the Weser. By false intelligence, the proconsul was induced to quit his intrenched camp. The Romans marched in a long straggling line, encumbered with baggage, with their wives and children. Suddenly, they were assailed by the Germans in a forest, and it was with difficulty they forced their way to a clear space to encamp for the night. For the next two days the Romans struggled on, marching and fighting, with decreasing forces, and exhausted strength, intending to reach, if possible, the fortresses of Aliso on the Lippe. Near Krentzberg, they were met by the main force of the Germans, and completely broken. V. killed himself in despair. Augustus, who was now old and weak, is said to have yielded to transports of grief, calling upon V. to give him back his legions. This victory of the Germans was gained 9 A.D., and rolled back the tide of Roman conquest. The Rhine, instead of the Weser, again became the boundary of the empire. The battle has ever since been a proud recollection for the Germans, and is known by the name of *Herman-schlacht*, that is, *Herman's fight*.

VARUS is a term employed in Surgery to designate a variety of Club-foot (q.v.). The corresponding Latin word signifies "having the legs turned inward, knock-kneed." It may be regarded as the opposite to *Valgus* (q.v.), and as in the case of that word, *Talipes* must be understood. In the form of club-foot termed *varus*, (1) the heel is raised; (2) the inner edge of the foot is drawn upwards; and (3) the anterior part of the foot is twisted inwards, so that the patient walks on its outer edge.

VASARHELY, or Hóldmező-Vasarhely, a town of Hungary, stands on a marshy plain, 5 miles from the left bank of the Theiss, and 16 miles n.e. of Szegedin. It is considered the largest market-town of Hungary, and indeed of Austria. Pop. (1869) 49,153, actively engaged in cattle-breeding, and in the cultivation of wine and tobacco.

VASARHELY, or Maros-Vasarhely, a handsome town of Transylvania, the seat of what are called the Szekler towns, and the centre of Szekler political life, stands on the Maros, on a fruitful plain 60 miles north-north-east of Hermanstadt. It has broad streets and well-built houses; excellent public schools, Protestant and Catholic—the latter richly endowed; a strong castle; and a choice public library, founded by Count Tekeli, and embracing 60,000 vols., among which are a MS. Tacitus, from the library of King Matthew Corvinus. Tobacco, wine, and fruit are largely cultivated. Pop. (1869) 12,678.—"Transylvania," by Charles Boner (Lond. 1865).

VASARI, Giorgio, an Italian painter and author, was born at Arezzo, in Tuscany, in 1512. He was a pupil of Michael Angelo's, and obtained the patronage of many distinguished persons, as Cardinal Ippolito de' Medici, Clement VII., and the Dukes Alessandro and Cosmo de' Medici; but his pictures possess no peculiar or distinctive merit, and his reputation rests exclusively on his "*Vite de' più eccellenti Pittori, Scultori, e Architetti*" (*Lives of the most excellent Painters, Sculptors, and Architects*; Flor. 2 vols. 1550; 2d ed. by V. himself, 3 vols. 1568). This work is written, on the whole, in a simple and honest style; at times, it is even marked by a noble eloquence. The criticism is often admirable; and in spite of frequent inaccuracies (which, indeed, have been corrected by Della Valle, Rumohr, Förster, and others), it remains a model of art criticism and biography. V. died at Florence in 1574.—Bohn has published an English translation of V., in 5 vols., forming part of the "Standard Library" series.

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Vasishtha

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VASCO DA GAMA. See GAMA.

VASCULARES, in De Candolle's botanical system, the first of the two great divisions of plants, consisting of those in which Vascular Tissue (q. v.) appears, and thus including all the phanerogamous plants, both endogenous and exogenous. See CELLULARES.

VASCULAR TISSUE, in Botany, that kind of vegetable tissue which is composed of closed tubes or vessels, elongated cells. The tubes have membranous walls of Cellulose (q. v.), and within them are juices of the plant, which often deposit secretions. They are generally almost cylindrical—although sometimes prismatic from compression—except that they taper to a point at each extremity, preserving their character as cells by being closed at the extremities. They lie close together in bundles, and often overlap one another at the ends. The principal kinds of vascular tissue are Woody Fibre (q. v.) and Laticiferous Tissue, composed of the vessels which convey the Latex (q. v.). Laticiferous tissue is generally composed of branched and anastomosing tubes, the walls of which are thin and delicate, extremely so in young plants. Many varieties of vascular tissue have, however, been distinguished by botanists, of which the most important are those classed under the name of *Fibro-vascular Tissue*, having spiral fibres in the tubes, winding up the inside of their walls as if to strengthen them. These fibres are elastic, and the coil can often be easily unrolled, at least whilst the tubes are young. Many fibres are often found in a single tube.

VASE (Lat. *vas*, Ger. *Flase*), a term applied, in its widest signification, to all vessels adapted either for ornament or for use. It is generally used in this sense with reference to ancient art; in connection with modern art, it is restricted to vessels of an ornamental kind. Few remains of antiquity have excited more interest than vases, particularly those of Greece, and of the Greek colonies and conquests. The names given by classical writers to vessels adapted for different purposes, have not always been easily identified with the ancient vases which have been preserved to us; but according to the nomenclature of M. Gerhard, which has generally been adopted, the following are the principal varieties, classified according to their uses: 1. Vases for holding wine, oil, or water, known under the names of *amphora* and *diota stamnos*. 2. Vases for carrying water, *hydria*, *calpis*. 3. Vases for mixing wine and water, *crater*, *kelebe*, *oxybaphos*. 4. Vases for pouring, *oinochoa*, *olpe*, *prochoia*. 5. Drinking cups or goblets, *cantharus*, *kyothus*, *karchesion*, *holchion*, *kyphos*, *kyliz*, *lepaste*, *phiale*, *keras*, *rhyton*. 6. Vases for ointments or perfumes, *lektyhos*, *alabastron*, *askon*, *bomylios*, *aryballos*, *kolytiscos*.

The materials of which vases are formed include metal, stone, glass, and earthenware.

Vases of the precious metals were in use among the ancient Egyptians. Among the Greeks and Greek colonists of Asia Minor, they were very early employed for sacrificial purposes, and those of silver were frequently chased, an art in which considerable progress had been attained at a remote period. The general improvement in design in the epoch of Phidias, told in the chaser's art, the complete development of which was, however, according to Pliny, due to Polykletos. In the later period of the Roman Republic, chased silver vases were more than ever in request; but under the Empire, chasing fell into disuse. Bronze, iron, and lead were all used as materials for vases. Bronze vases abounded among the presents made to the Greek temples; they were generally thin and hammered out, often decorated with inlaid ornaments or reliefs, among which mythological subjects and animal heads appear, and the handle sometimes assumed the shape of the human figure. Lead vases were chiefly used for unguents or perfumes. The gold and silver vases of the first few centuries of the Christian era were, for the most part, imitations of pagan art. In the 12th c., a style was introduced, called *damascene* work, with patterns of gold or silver wire embedded in iron or bronze. Many vases of this kind were made by Bevenuto Cellini.

Among the mineral materials which, plain and enriched, have been used both in ancient and modern times for vases, are marble, lapis lazuli, jasper; semi-transparent stones, such as opal, girasol, agate, chalcedony, sardonyx, cornelian; as also transparent gems and rock crystal. Multitudes of vases of precious stones were brought to Rome from the conquered provinces, particularly from Asia. Those in highest

esteem were the *myrrhine* vases, whose material has been the subject of dispute among antiquaries; they are described by Pliny as brilliant, gem-like, and of various colors, generally purple and white, mingled with the iridescent hues of the rainbow. Precious stones have not ceased to be a material for vases; large and costly vases of malachite and jasper are manufactured in Russia; and elaborately carved vases are still made of the white alabaster of Volterra, in Tuscany.

Glass has at all times been a favorite material for vases. Small toilet-phials of opaque glass were in use in Egypt as far back as 1450 B.C. The cameo vases of Rome, of which the Portland vase is the most celebrated example, were composed of two layers of glass, the outer of which, being opaque, was cut down into groups of figures, delicately executed in relief. About the 8d c., we have, for the first time, the *diatreta*, or bored vases, with an external veil of network, almost detached from the rest of the glass. In the 5th c., occur vases, composed of two layers of glass, with gilded subjects—often figures of Christ and legends of saints—between them. Vases of green glass, of a later period, with undercut projections, bearing a rude resemblance to the *diatreta*, have been found in tombs in England and France. Venice afterwards acquired great celebrity for its glass vases. In the beginning of the 16th c., the Venetian glass-makers introduced a class of vases enriched with white or colored filigree work, having the appearance of being incrustated in the glass. They were much sought after all over Europe; and great care was taken to prevent the secret of their manufacture from being discovered. Beautifully enameled vases were also found from the Venetian manufactories, as well as others of grotesque forms, representing imaginary animals, and pierced with holes or constructed in the form of a siphon, which are said to have been employed by alchemists, and in pharmacy and distillation. The German manufacturers, in the 16th c., produced vases with heraldic designs and inscriptions in enamel, generally cylindrical, and sometimes of considerable size, which are much prized by connoisseurs; in the following century, the designs became more artistic; and both in Germany and Italy. It was quite usual for distinguished artists to be employed to decorate these glass vases, in imitation of rock crystal, with ornaments, arabesques and engraved subjects.

The most prevalent material for vases of all kinds, including those intended to hold the ashes of the dead, has generally been baked clay. Multitudes of Greek sepulchral vases have, after a lapse of more than fifteen centuries, been brought to light, at a time when learned men can appreciate them, and gather from them valuable information in history and archaeology. An account of the terra-cotta vases of Greece, Italy, and other countries, is given under POTTERY.

VASISHTHA (the superlative of the Sanscrit *vasumat*, wealthy) is the name of one of the most celebrated Vedic Rishis (q. v.), the author of several hymns of the R'igveda, and a personage who seems to have played an important part in the early history of the Brâhmanic or priestly caste of the Hindus. In the account given of him, historical events and mythological fictions are so much blended together, that it is scarcely possible to gather more from it, for certain, than that he was a sage of high reputation, and a priest jealous of the privileges and the position of his caste, and ever ready to assert its superiority over the second or military and royal caste. In one of his R'igveda hymns, he claims to have been enlightened by the god Varunâ; and in another he is called the son of Mitra and Varunâ (q. v.), born from the mind of Uroasî (q. v.). In other Vedic passages, his pre-eminence over other Rishis, and his acquaintance with sacred and sacrificial knowledge, are extolled. In the Matsyâhâra (q. v.), which also calls him the son of Mitra and Varunâ—whence his appellation there, *Maitrâvarunî*—he is mentioned as imparting divine knowledge to King Janaka, and as the family priest of the race of Ikshvâku; and in the Purânas he is said to have been one of the arrangers of the Vedas in the Dvâpâra age. In Manu and Purânas (q. v.), he becomes a patriarch, one of the five mind-born sons of the god Brâhman; and according to some, marries Urjâ (Strength); according to others, Arundhati, one of the Pleiades, by whom he has seven sons. Various other legends relating to him always endeavor to impress the Hindu mind with his Brâhmanic power over kings and Kshatriyas generally. Thus, so great was his power, as the Raghavans' relates, that when King Dilipa was doomed to remain childless, because he had inadvertently offended the fabulous cow Surabhi, he was released of this curse by faithfully attending on the cow of V., which was the cow of plenty, and an offspring of Surabhi. But the

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Vauban

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most interesting episode of his life is that relating to his conflict with *Viśvāmitra* (q. v.). A *Viśvāmitra* is also mentioned as the author of a law-book; but whether he is, or is intended to be, the same personage as the ancient sage, may be doubtful. The name is often written *Vas'isht'ha*, when it would be the superlative of *Vas'a*, meaning "the most humble"—which the epic and *Purāṇic* V. certainly was not—or of *Vas'in*, meaning "the sage who has thoroughly subdued his passions"—which, too, would seem to be a rather strange epithet of the frascible saint. But though the name of the owner of the cow of plenty, who could obtain anything he desired, is doubtless correctly spelled *Vasist'ha*, the less correct spelling must nevertheless have been current for a considerable time, since so early a poet as *Kālidāsa* (q. v.), in his *Raghuvans'a*, puns on the words *vas'i vas'isht'ha*, "Vas'isht'h'a, the sage with subdued passions."—See, for the legends concerning V., J. Muir's "Original Sanscrit Texts," vol. i. (1858).

VASSAL (Celtic, *guás*, a youth or page), in the Feudal System, is the correlative of Suzerain (q. v.). See also **SUPERIOR**, **FEU**.

VASSILKO'V, a town of Little Russia, in the government of Kiev, and 18 miles south-west of the city of that name. This town, which was founded in the 10th c., contains 10 factories, 5 of which are employed in the manufacture of tobacco. Pop. (1867) 16,076.

VASTO, or **Il Vasto**, a town on the east coast of Southern Italy, in the province of Chieti, 26 miles south-east of Ortona. It stands on a rising ground facing the Adriatic, from which it is distant $1\frac{1}{2}$ mile, is enclosed by walls, contains a spacious square with a handsome fountain, a handsome palace, a castle, and several churches. It carries on an active trade in corn, oil, and vinegar. Pop. 12,000.

VASUDEVA and **VASUDEVA**. See under **VISHN'U**.

VATERIA. See **TALLOW TREE**.

VATICAN, Palace of, in Rome, the principal residence of the pope, and the seat of the great library and the museums, and collections of art, ancient and modern, which, for visitors, constitute one of the chief attractions of the city of Rome. The popes, very soon after the establishment of the peace of the church under the Emperor Constantine, had a residence at the V., which they occupied, although at uncertain intervals, conjointly with that of the Lateran. For a long time, however, through the medieval, and especially the late medieval period, the V. appears to have been neglected. It was Nicholas V. who began that systematic scheme for the improvement and embellishment of the V. which has resulted in what, taken altogether, may be regarded as perhaps the noblest of princely residences. Alexander VI., Julius II., and above all, Leo X. pursued the same plan; and there are very few of the succeeding popes who have not had a share in the enlargement or embellishment of the Vatican. Amid all the difficulties, financial and political, of his pontificate, Pius IX. effected many tasteful works of completion or restoration, the most striking and effective of which is the great stair by which it is approached from the colonnade of St Peter's. The building, with its gardens and other appurtenances, is said to cover a space equal to the whole area of the city of Turin, such as it was thirty years ago, with a pop. of 180,000. It is popularly believed to contain 16,000 apartments of various sizes, but this is probably an exaggeration. Some of them, however, are of unrivalled beauty, among which may be particularised the chapel of San Lorenzo, the Pauline Chapel, and the still more celebrated Sixtine Chapel, which is decorated in frescoes from the pencil of Michael Angelo; the Sala Regia, the galleries and halls decorated by Raphael, Giulio Romano, and their scholars; the magnificent library, which, although surpassed in the number of volumes, is rivalled among the cities of Europe in extent, in beauty of proportions, and in decorations; the galleries of antiquities, Christian and pagan, and of paintings, statuary, bronzes, medals, vases, and other objects of art. Many descriptions of the V., with costly illustrations, have been published, and are to be found in all great libraries. An extremely interesting account, historical and descriptive, is to be found in Douvau's "Rome, Ancient and Modern;" see also Murray's "Handbook of Rome," and A. J. C. Hare's "Walks in Rome."

VATTEL, Emerich, a well-known writer on the law of nations, was born at

Couret, in Nenfchâtel, 25th August 1714. His father, a Protestant clergyman, had been ennobled by the king of Prussia, whose subject he was. V. studied for the church at Bâle and Geneva, but he devoted greater attentions to the writings of Leibnitz and Wolf than to those of the Calvinistic divines; and instead of becoming a country clergyman, he resolved to push his fortune at the court of Berlin, as a man of letters and diplomatist. In 1741, he offered his services to Frederick II., who had just ascended the throne, but there was then no vacancy in the public service. Three years afterwards, he received an appointment at Dresden from the Elector of Saxony, then also king of Poland; and in 1746, he was sent by him as minister to Bern. In this post he had ample leisure, and devoted himself to literary pursuits. He published, in French, under different titles, collections of essays on miscellaneous subjects, which are lively, and well written. But his chief attention for ten years was bestowed on his great work, the "*Droit des Gens; ou Principes de la Loi Naturelle appliqués à la Conduite et aux Affaires des Nations et des Souverains.*" This title sufficiently explains the scope of the work. It contained little that was new but it abridged and systemised the doctrines of Grotius, Puffendorf, and Wolf. V. had, however, that skill in arranging his materials, and that power of lucid expression, which so often characterise French men of letters; and his book became rapidly popular as a text-book of international law. Like all his predecessors in the same field, V. based his whole system on an imaginary law of nature, and it would be easy to enumerate a large number of false conclusions to which he came in the absence of the light thrown on the law of nations by practice, and by the principle of utility in our time, so generally adopted as the test of international morality. After the completion of his great work, V. was recalled to Dresden, where he married, in 1764, Marianna de Chêne, and was promoted to the rank of privy-councillor. The duties of his new post proved too arduous, and he died of over-work on 25th December 1767. Mr Chitty republished, in 1838, an English translation of Vattel, with notes.

VAUBAN, Sébastien le Prestre, Marshal of France, the celebrated military engineer, was born at St Leger de Fougères, in the dep. of Nièvre, 15th May, 1633; and being left an almost destitute orphan at the age of ten, his education was carried on under the auspices of the *cure* of his village. Leaving Saint Leger in 1651, he set out on foot to join Condé's army, then on the Belgian frontier; and during two years of active field-service, obtained large insight into the engineering methods then in practice. Taken prisoner in 1653, he joined the royalists, and during the succeeding contest was mostly attached to the army of Turenne, who intrusted him with the sole control of the besieging operations; and the powerful assistance which the extraordinarily rapid reduction of the enemy's strongholds gave to the king's little army, gained for V. the repute of being the most promising young engineer of the time. On the conclusion of peace in 1660, he was despatched to the west to demolish the rebel strongholds in Lorraine, and to take charge of Breisach; but in 1667, he appeared again in the north, capturing one after another the powerful defences of the Belgian frontier. About this period, the all-powerful Louvois, charmed by V.'s probity, punctuality, and habits of cool calculation, no less than by his genius, took him firmly by the hand; and it was as much owing to the great minister's favor as to the superiority of his designs that V. was preferred to the highly honorable and important office of fortifying the Flemish fortresses which had fallen into the possession of France. This labor accomplished in 1672, and the war with Holland resumed, V. took his old place as director of the siege operations, and for the first time introduced into practice in Western Europe the method of approach by parallels (recently borrowed from the Turks), at the siege of Maastricht (1673), and with such effect, that that strong fortress capitulated in thirteen days. After tracing the plan of siege for Treves, and with remarkable sagacity foretelling the date when it *must* fall, he set himself with energy to strengthen the newly-acquired fortresses in the Low Countries, and closed a long and brilliant array of services for 1674 by throwing himself into Oudenarde, where William of Orange besieged him in vain. In 1675, he inaugurated a new era in military tactics by obtaining the creation of a corps of engineers, though the completion of the innovation by the establishment of companies of sappers was denied him. In 1676, he conducted the remarkable sieges of Valenciennes and Cambrai, stormed the

later in open day, against the unanimous opinion of the generals of the army; and two years later, was rewarded for his long and glorious services by the appointment of director-general of fortifications. This post gave him the supreme control of the department of military engineering, and the ten years of peace which followed 1673 supplied opportunity for V.'s rendering to France perhaps the greatest of his services, in surrounding the kingdom with a complete cordon of fortresses, fitted either for defence or for commanding weak points of the neighboring countries. At intervals during this period, he captured the almost impregnable fortresses of Luxembourg, and planned and partly executed the magnificent aqueduct of Mainteuon, by which the waters of the Eure are conveyed to Versailles.

War breaking out again in 1688, V. conducted the sieges of Philippsburg, Mannheim, and Frankenthal (introducing, at the last, his invention of ricochet-firing), Mons (1691), and Namur (1692), with his usual success, though opposed at the last-named place by his great rival, Colborn, who had fortified, and who defended it. After this period, V. almost disappears from the field of warfare, on which he had stood invincible for so many years, for the sieges of Charleroi (1693), Ath (1697), Brisach (1704), and the construction of the intrenched camp near Dunkirk (1706), are the only professional works of importance during the last 14 years of his life. After the peace of Ryswick in 1697, he had applied his active practical mind to the consideration of various deficiencies and anomalies in the internal government of France; and his zeal and research brought together a large mass of information and suggestion on numerous subjects, which was published under the curious title of "*Oisivetés de M. de Vauban*," and contained recommendations for the collection of statistics of population, commerce, and agriculture, for supplying the army by recruitment, and valuable suggestions for improving the soil by drainage, &c. &c. Another of his works which excited an immense sensation at the time was the "*Dîme Royale*" (1707), in which he discussed the question of taxation, and anticipated in the most striking manner the doctrines which, a century later, overthrew the French monarchy: such principles promulgated by a man of V.'s sterling integrity and profound practical wisdom, could not be expected to be very palatable to the king and court, of whose conduct they furnished indirectly the severest censure; and we are not therefore surprised to learn from Saint-Simon "that the Marshal de Vauban was very ill received when he presented himself," and that, by an edict of February 14, 1707, his book was seized and confiscated. V. did not long survive his disgrace, dying at Paris, March 30, 1707. Fontenelle calculates that he had constructed 83 new fortresses, repaired 300 old ones, conducted 53 sieges, and had been present at 140 "actions of vigor;" and in his practice, the capture of a fortress was certainly a mere question of time and powder. His various professional works on the attack and defence of places, and on mines, have been collected under the title of "*Œuvres Militaires*" (Paris, 1796); and besides these, we have various other Memoirs on professional subjects from his pen. Historical notices and eulogies of V. are abundant in French literature. See "*Nouvelle Biographie Générale*."

VAUCLUSE, a dep. in the south-east of France, bounded on the w. by the Rhone, and on the s. by the Durance, which separates it from the dep. of Bouches du Rhone. Area, 1365 sq. m.; pop. (1876) 255,703. The Rhone is the great river, and its affluents, with the exception of the Durance, are all small. The dep. is traversed in the east by spurs of the Alps. The plains are all in the west—the chief being those of Orange, Carpentras, and Cavallou. In the east, the mountains are separated by narrow, torrent-ploughed valleys; and the summits, the chief of which is Mont Ventoux, 6778 feet high, are arid and bare. The climate is healthy and temperate, although subject to great variations—the winds from the north and north-east being sometimes very violent. The dep., though more agricultural than manufacturing, does not produce cereals in great quantity; but the peach, pear, prune, almond, and fig trees bear excellent fruits. Olive, mulberry, and orange trees are quite common. Wines and honey, both held in high esteem, are produced. There are four arrondissements—Avignon, Apt, Carpentras, and Orange. Avignon is capital.

VAUD (Ger. *Waadt*), a canton which forms the western corner of Switzerland between the Jura and the Bernese Alps. Area, 1240 sq. m.; pop. (1876) 242,432. It is

a comparatively level district, traversed, however, by an elevated tract, known as Mount Jorat, from which plains slope on either side to the Lake of Geneva, on the south, and the Lake of Neuchâtel on the north. On both sides near the mountains, there are extensive pasture-lands, but the greater part of the country is highly cultivated. The orchards and vineyards are very extensive, the latter yielding white wines of excellent quality. There are no manufactures of any importance. It is now traversed by railways, which connect it in two directions with France, and in three with the rest of Switzerland. It forms part of French Switzerland, the dialect spoken being the *Vaudais*. The religion is Protestant. V. has formed, since 1850, a democratic republic, the council of the canton being elected and controlled by the people. In 1845 and 1861, the rights of the people were still further extended. V., after the fall of the Roman Empire, formed part of the Burgundian kingdom. In the 13th c., it became a dependency of Savoy, to which it was annexed in 1559. In 1476, the House of Savoy took part with the Duke of Burgundy in his struggle with the Swiss; and on his defeat, a part of V. was annexed to the adjoining cantons. In 1536, the Bernese took possession of the whole of V., which they divided into fifteen parts, administered by *baillis*, appointed at Bern. The nobility became patricians of Bern, and in this way acquired great influence. Still, the local councils had the power of appointing magistrates and administrative officers, which, to some extent, tempered the aristocratic character of the government. The French invasion put an end to the rule of Bern, and V. became a separate canton. The government remained in the hands of the higher classes until June 1830, when a new constitution, granting a vote to every adult *bourgeois* of good character, was obtained from the council. The existing democratic-representative constitution dates from 1845. The *Vaudais* are industrious and well educated; and from this part of Switzerland come a large number of the Swiss teachers and governesses who are met with in all parts of the world. Capital, Lausanne (q. v.).

VAUDEVILLE, originally a popular song with words relating to some story of the day; whence it has come to signify a play in which dialogue is interspersed with songs of this description, incidentally introduced but forming an important part of the drama. The German "*Liedertafel*" is a somewhat similar composition. The name *Vaudeville* is a corruption of *Vaux de Vire*, the name of two picturesque valleys in the Bocage of Normandy. One Olivier Busselin, a fuller in Vire (q. v.), composed about the middle of the 15th c., a number of humorous and more or less satirical drinking-songs, which were very popular, and spread over France, bearing the name of their native place (*Les Vaux de Vire*). As the origin of the term was soon lost sight of, it at last took its present form. In the 16th c., Vauquelin still names such pieces *Les Vaux de Vire*.

VAUDIOS. See **WALDENSES**.

VAULT, an arched roof, usually constructed of stone or brick-work. The simplest kind of vault is the plain wagon or tunnel vault, being a simple segmental or semicircular arch, thrown across a longitudinal apartment, and extending from one end to the other. Ordinary bridges shew an example of this kind of vaulting. Such vaults were commonly used by the Romans, who also built vaults with *groins*—i. e., vaults intersecting one another. See **GROINED VAULTING**. The tunnel arch, of a pointed form, was of very ancient introduction, having been used by the Assyrians for vaulting their large drains.

The Egyptians are also said to have been acquainted with vaulting; but the earliest remains of ancient vaults of any magnitude are Roman works.

The Roman vaults, where groined, are usually constructed with carefully cut stone, so as to prevent the angle from chipping. The medieval architects had not the costly materials or skill of the Romans at command, so they formed the groins only of dressed stone, and the filling in of the vault with commoner materials. This led to the groin becoming a prominent feature in medieval architecture, being generally ornamented with mouldings and carved work. We have already traced the progress of Gothic vaulting under the heads **GOTHIC ARCHITECTURE**, **FAN-TRACERY**, **VAULTING**, **RIB**, &c. Domical or hemispherical vaulting was also much used by the Romans. The Pantheon, in Rome, is the finest example remaining, being a

circular building with a dome 142 feet in diameter. Roman domes and vaults are frequently ornamented with sunk panels. During the Renaissance period, vaulting in great measure gave place to wooden roofs; but when employed, the domical or plain groined vaults of Roman architecture are chiefly used. In modern works, vaults and arches are gradually becoming superseded by the use of iron construction, both for roofs and for supporting floors, bridges, &c.

VAULTING-SHAFT, a small column, or pillar, supporting the ribs of a Gothic vault. These shafts generally occur in clusters, and may either spring from the ground, or be supported on small corbels in the wall.

VAUMURE, in old fortresses, a low work under the wall, in the nature of a *fausse-braye*.

VAUQUELIN, Jean, a French poet, was born in 1535, of a noble family, at the château of La Fresnaye, near Falaise. He made a pretence of studying law at Poitiers, Paris, and at Bourges, but really spent his time in gaiety and verse-making. He finally became president of the *Présidial* bench at Caen, where he died in 1607. His "*Œuvres Postiques*" contain many sportive songs and other light pieces, which are yet read with pleasure. He was the first writer of *Idyls* in French verse, and is considered as the real founder of French satire, which he redeemed from the grossness that had hitherto characterised the productions that went under that name.

VAUXHALL, a famous public garden in London, constituted as such immediately after the Restoration (May 1660), and supporting that character for nearly two centuries. It was situated in Lambeth, opposite Millbank, and near the manor called Fulke's Hall (the residence of Fulke de Breauté, a follower of King John), from which is derived the name Vauxhall. Pepys, writing May 28, 1667, describes the garden, and concludes that the entertainments there to be had are "mighty divertising." But the pastimes of V. were not always of a merely "divertising" description. The eating, drinking, dancing, and flirtation that continually went on there, led to much quarrelling and dissipation. On the whole, V. does not appear to have been particularly strict in its morals. The loose character of the amusements it afforded is freely sketched by the dramatists and novelists of the last century, and is again revived in Thackeray's "*Vanity Fair*."

VAUXHALL NECTAR, a mixture of rum and syrup, with an addition of benzoic acid, or flowers of Benjamin, in the proportion of half a dram to the quart. It was formerly in much repute as a drink, and was taken mixed with water. It was also called British arrack.

VA'VASOUR, or *Valvassor* (derived, like *vassal*, from Celtic *guán*, a youth or page), a term of feudal times, more in use in the continent of Europe than in England, employed somewhat loosely, and defined by Camden as the rank next below a baron. Its usual meaning was one who held his lands, not directly of the crown, but of one of the higher nobility. In this class were comprehended the *châtelains*, who owned castles, or fortified houses, and possessed rights of territorial justice.

VAYGA'CH (also written *Vaigatch*, *Vaigatz*, and *Waigatz*), an island of the Arctic Ocean, belonging to Russia, stands between the mainland and the island of Nova Zembla, from the former of which it is separated by a strait about 5 miles broad. There is no resident population; but, being productive in furs and in fish, it annually attracts a number of Russian and Samoied hunters.

VĀYU (from the Sanscrit *vā*, blow), the wind, is, in the Vedic Mythology of the Hindus, a deity, which originally seems to have held an equal rank with Indra (q. v.), but much more rarely occupies the imagination of the poets than this god, or Agni, or the sun; for though, according to *Yāska* (q. v.), ancient commentators of the Vedas hold that there are only three great deities—viz., *Āgni*, fire, whose place is on earth; *Sūrya*, the sun, whose place is in heaven; and *Vāyu* or *Indra* (q. v.), whose place is in the intermediate sphere—only a few hymns, comparatively speaking, are dedicated to Vāyu, whereas the other deities named are the subject of manifold praise. The description given by the *R'igveda* of the greatness of Vāyu nevertheless answers the position which those ancient commentators assign to him.—See J. Muir's "*Contributions to a Knowledge of the Vedic Theogony and Mythology*," in the "*Journal of the Royal Asiatic Society*" for 1864. In the epic and Purānic mythology, V. occupies but an inferior position, and the legends there related of him

have no cosmical character. They give him a wife, *Anandā*, by whom he has a son, the monkey *Hanumat* (q. v.). When represented, V. either rides on an antelope, with a sabre in his hand, or he is seated holding his son *Hanumat* in his arms.

VAYU-PURAN'A. See PURAN'A.

VEDA (from the Sanscrit *vid*, know; kindred with the Latin *vid*-, Greek *id*-, Gothic *vatt*-, Lithuanian *veizd*-; hence, literally, knowledge) is the technical name of those ancient Sanscrit works on which the first period of the religious belief of the Hindus is based. See INDIA, sec. Religion. The oldest of these works—and in all probability the oldest literary document still existing—is the “R̥gveda;” next to it stand the “Yajurveda” and “Sāmaveda;” and the latest is the “Atharvaveda.” The first three also bear the collective title of *trayi*, or “the threefold” (sci. science); and all four are considered to be of divinely inspired origin. Each of these Vedas consists of two distinct divisions—a “Sauhita,” or collection of *mantras*, or hymns; and a portion called “Brāhman’a.” A *mantra* (from *man*, think; hence, literally, the means by which thinking or meditation is effected) is, as Colebrooke, in conformity with the Mīmāṃsā writers, defines the word, a prayer, or else a thanksgiving, praise, or adoration addressed to a deity: it declares the purpose of a pious act, or lauds or invokes the object; it asks a question, or returns an answer; either directs, inquires, or deliberates, blesses or imprecates, exults or laments, counts or narrates, &c. Sometimes it is addressed to the deity with a verb in the first person; sometimes it ends with the verb “thou art,” or with the word “thee.” See Colebrooke, “Miscellaneous Essays,” i. p. 308; Müller, “Ancient Sanscrit Literature,” p. 343; Jaiminiyanyāyamañjavastara, as quoted in Goldstücker’s “Pāṇini,” p. 69. If such a *mantra* is metrical, and intended for loud recitation, it is called *R̥ch* (from *r̥ch*, praise)—whence the name *R̥gveda*, i. e., the Veda containing such praises—if it is in prose, and then it must be muttered inaudibly, it is called *Yajus* (from *Yaj*, sacrifice; hence, literally, the means by which sacrificing is effected); therefore, *Yajurveda* signifies the Veda containing such *yajus*. And if it is metrical, and intended for chanting, it is termed *Sāman*; whence *Sāmaveda* means the Veda containing such *sāman*. (The original meaning of the latter word is obscure. Native grammarians derive it, but without much probability, from *so*, to give pain, because, they say, “it is difficult to utter such mantras.” A mystical, but grammatically impossible, account of *sāman* is given in the “Śatapatha-brāhman’a” and “Bṛihadāraṇ’yaka,” where the word is analysed into *sā* and *ama*, the former being interpreted as implying “speech,” and the latter “breathing forth.” Since the chanting of the *sāman*, as the commentator says, is essentially the result of both.) No special name is given to the mantras of the fourth Veda. The author of the *mantra*, or, as the Hindus would say, the inspired “seer,” who received it from the deity, is termed its *Rishi* (q. v.); and the object in which the *mantra* is concerned is its *devatā* a word which generally signifies “deity,” but the meaning of which, in its reference to the *mantra*, must not always be taken literally, as there are hymns, in which not gods or deified beings, but, for instance, a sacrificial post, a remedy against bad dreams, the generosity of princes from whom gifts were received by the authors, or a chariot, a drum, weapons, the charioteer and horses employed in war, and other worldly objects, invoked, are considered as the *devatā*.—See Colebrooke’s “Misc. Essays,” i. p. 32; Wilson’s “R̥gveda,” vol. i., in the edition of F. E. Hall, p. 347.—*Brāhman’a*—derived from *brahman*, neuter, probably in the sense of prayer or hymn (see concerning this word J. Muir, “on the Relation of the Priests to the other Classes of Indian Society in the Vedic age,” in the “Journal of the Royal Asiatic Society” for 1864; and the Introduction of M. Haug’s edition of the *Altireya Brāhman’a*, vol. i. p. 4)—designates, according to *Madhava-Sāyaṇ’a*, the great commentator on the Vedas, that portion in prose of the Veda which contains either commands or explanations; or, in other words, which gives injunctions for the performance of sacrificial acts, explains their origin, and the occasions on which the mantras had to be used, by adding sometimes illustrations and legends, and sometimes also mystical and philosophical speculations. The *Brāhman’a* portion of the Vedas is therefore the basis on which the Vedic ritual rests (see KALPA and VEDĀṅGA), and whence the *Upanishads* (q. v.) and the philosophical doctrines (see SANSKRIT LITERATURE) took their development.

Though *Mantras* and *Brāhman’as*—both of which are also termed *S’ruti* (q. v.)—were held at a later period of Hinduism to have existed simultaneously, that is,

from eternity, it is certain that the Brāhman'a portion of each Veda is posterior to at least some part of its Samhitā, for it refers to it; and it scarcely requires a remark that so great a bulk of works as that represented by both portions must have been the gradual result of a considerable period of time. There is, indeed, sufficient evidence to prove that various conditions of society, various phases of religious belief, and even different periods of language, are reflected by them. The difficulty, however, critically to discern these periods, is enhanced by the losses, probably considerable, which these writings suffered before they were preserved in the shape in which we now possess them. For in tradition, which records that *Vyāsa* (q. v.), after having compiled and arranged the Vedas, handed each of them to four disciples, and that these disciples taught them to their disciples, and so forth, down to distant ages, there is so much indubitable, that Mantras and Brāhman'as had to pass through a large number of S'ākhās, or schools, and that the discrepancies which gradually arose between these schools, both as regards the Vedic texts and the interpretation of these texts, cannot have been slight; for, apart from the conclusion yielded by a comparison of the remaining texts of some of these schools, later writers afford us an insight into the animosity which existed between these schools, and must have arisen from very material grounds. Thus, in a commentary on "Pāraskara's Gr̥hya Sūtras," it is said: "Vasishṭha declares that it is wrong to follow the rules of another S'ākhā. He says: 'A wise person will certainly not perform the duties prescribed by another S'ākhā; he that does is called a traitor to his S'ākhā. Whosoever leaves the law of his S'ākhā, and adopts that of another, he sinks into blind darkness, having degraded a sacred R̥ishi.' And in another law-book it is said: 'If a man gives up his own customs, and performs others, whether out of ignorance or covetousness, he will fall, and be destroyed.' And again in the 'Paris'ṣṭi's' of the 'Chandoggas': 'A fool who ceases to follow his own S'ākhā, wishing to adopt another one, his work will be in vain.'—See Müller's "Ancient Sanscrit Literature," p. 51. That each S'ākhā claimed the possession of the only true and genuine Veda, may be already inferred from passages like these. The differences between these S'ākhās, however, did not consist—as has been believed—in their various readings of the Śruti alone; it also consisted in considerable variations of their arrangement of the scriptures; in their additions or omissions of texts—as may be seen from still existing S'ākhās of the Yajurveda—and, as is stated by *Madhusūdana*, and results from a commentator on Pāṇini, in their different interpretation of the Vedic texts. How great the number of these S'ākhās was, may be inferred from the statement of the "Chāraṇavyākhyā," a treatise ascribed to an ancient writer, S'annaka; for it enumerates five S'ākhās of the R̥igveda; says that there were 86, and names 42 (or in one recension 44) of the Yajurveda; mentions twelve of the Sāmaveda, out of a thousand, which, it says, were at one time in existence, and nine of the Atharvaveda. The "Ātharvan'arabhasya," a modern treatise on the Atharvaveda, while ascribing the same number of S'ākhās to the Sāmaveda and Atharvaveda, speaks of twenty-one of the R̥igveda, and a hundred of the Yajurveda. Of all these schools, however, the *R̥igveda* is now extant only in one; the *Yajurveda* (both divisions), to be named hereafter, taken collectively) in three, and partially, in four; the *Sāmaveda* in perhaps two; and the *Atharvaveda* in one.

The character of the Samhitā or Mantra portion of the four Vedas—on which their Brāhman'a portion is based—as well as the relation in which these Samhitās stand to each other, is intelligible only if it is borne in mind that the ancient Hindu believed to secure the favors of his gods chiefly by the performance of sacrificial rites; that gradually these rites became complicated and manifold, and that special care, therefore, had to be taken to provide for a correct celebration of the sacrifices which had sprung up, and also to guard against the evil consequences which might result from inadvertence, or other causes beyond the sacrificer's control. The original worship seems to have been simple enough (See *INDIA*, sec. *Religion*)—it probably neither occupied much time, nor required the assistance of a priest. But when sacrifices were instituted which lasted from one day to eleven, nay, to a hundred days—and some works speak of sacrifices which went on for the space of one and even several years—and when the Brahmanic caste found the performance of such sacrifices to be an excellent means of establishing its sway over the other castes, and a convenient source of an easy livelihood, it was laid down as a rule that no sacrifice could be performed without one *R̥ishi*, or priest; and that a great sacri-

See, such as the Jyotisht'oma, Rājasya, or other sacrifices which could only be celebrated by wealthy people or kings, required the assistance of not less than sixteen priests, besides a number of menials, who had to slay the sacrificial animals, to chant, or to perform other inferior work. These sixteen priests were then divided into four sections, each headed by one R'itwij, and containing besides him, his three parushas, or assistants. The first section consisted of the *Adhwaryu*, with his three parushas, the *Pratiprasthāt'r'i*, *Nesht'r'i*, and *Unnet'r'i*; the second, of the *Brahman*, with the three parushas, *Brāhmanāchellhanein*, *Agnidh* (or *Agnidhri*), and *Potr'i*; the third, of the *Udgāt'r'i*, with the *Prastotr'i*, *Pratihartr'i*, and *Subrahman'ya*; and the fourth of the *Hot'r'i*, whose assistants were the *Maitrāv-arun'a*, *Achellhāvāka*, and *Grāvastut*. (In other accounts, the order of these sections varies, and in the section headed by the Brahman, the *Potr'i* precedes the *Agnidh*; see also Müller, "Ancient Sanscrit Lit.," pp. 463, 469; where, however, by mistake, some of the assistant priests occur in the wrong sections.) The principal duties of these priests were further regulated in the following manner. The *Hot'r'i* had to perform the rites relating to the R'igveda, the *Adhwaryu* those based on the *Yajurveda*; the *Udgāt'r'i* was concerned in the rites of the *Sāmaveda*; and the Brahman had to possess a knowledge of all these three Vedas, and to set right any mistake that might have occurred in the performance of the ritual acts, or remedy any defect which might vitiate the efficiency of the sacrifice. He was therefore the most learned of all the priests; and the R'igveda itself, though perhaps in one of its latest portions, recognises this superiority of the priest Brahman. In the ritual works relating to the first three Vedas, no functions based on the use of the latest or the Atharvaveda are assigned to him, but in the *Saunaka-Brāhmaṇa* of the *Atharvaveda*, where *Prajāpati* is introduced as intending to perform a Soma sacrifice, and asking the Vedas whom he should choose for his *Hot'r'i*, *Adhwaryu*, *Udgāt'r'i*, and Brahman, the Vedas answer him: "Choose for a *Hot'r'i* (the priest) who knows the R'igveda; for an *Adhwaryu*, (the priest) who knows the *Yajurveda*; for an *Udgāt'r'i*, (the priest) who knows the *Sāmaveda*; and for a Brahman (the priest) who knows the *Atharvaveda*;" and to explain the reason for such advice, they add that the R'igveda hymns having the earth for their abode, one who chooses a *Hot'r'i* will obtain dominion over the earth; the *Yajurveda* mantras resting on the intermediate space, one who engages an *Adhwaryu* will obtain the world of that space; the *Sāmaveda* hymns dwelling on heaven, one who employs an *Udgāt'r'i* will obtain that world; but one who chooses a Brahman will encompass the world of (the nether) Brahman, or the supreme spirit, since the hymns of the *Atharvaveda* have for their abode Brahman.

The most interesting feature of this and similar passages is the tendency of their authors to maintain the greater efficiency of one of the later Vedas in comparison to that of the R'igveda, and consequently the greater practical superiority of these Vedas over the avowedly oldest Veda. And this is intelligible enough, if we compare the contents of these Vedas.

The worship alluded to in many hymns of the R'igveda must have consisted more of isolated sacrificial offerings than of a series of acts strung together so as to form an elaborate sacrifice. There are other hymns, it is true, which betray the existence, at their time, of a ritual, already become complicated, as when three or four, or even seven priests are mentioned by the poet; but though these hymns, as well as the former, bear testimony to the existence, at that early period, of ritual acts, it does not follow that the R'igveda, as such, was composed for the purpose of being recited when they were performed. From the nature of its hymns, it results, on the contrary, that, having been composed, they were at some subsequent period connected with those pious acts which became more and more complicated, and gradually were systematised. But then even there remain verses which would not easily bend to such artificial purposes; and whole hymns, too, which would resist an attempt to force them into a liturgical code for which they were not intended by the poet's mind. A collection of songs, in short, which was the natural growth of time, and, to some extent, at least, the ingenious outburst of the poets' feelings, became inadequate for a regular liturgy of a highly-developed and throughout artificial ritual. Out of this necessity there arose the *Sāma*- and the *Yajurveda*. The former was entirely made up of extracts from the R'igveda, put together so as to suit the ritual of the so-called Soma sacrifices. For, as all native authorities agree in stating

that the Sāmaveda contains none but R'igveda verses, the absence of 71 verses in the recension of this Veda, edited by Professor Benfey, from the recension in which the R'igveda now exists, does not disprove their unanimous statement: it must be accounted for by the circumstance, that these verses belong to one or the other of the recensions of the R'igveda, which, as mentioned before, are no longer preserved. The origin of the Yajurveda is similar to that of the Sāmaveda; it, too, is chiefly composed of verses taken from the R'igveda; but as the sphere of the ritual for which the compilation of this Veda became necessary is wider than that of the Sāmaveda, and as the poetry of the R'igveda no longer sufficed for certain sacrifices with which this ritual had been enlarged, new mantras were added to it—the so-called Yajus, in prose, which thus became a distinctive feature of this Veda; and it is on the Yajurveda, therefore, that the orthodox Hindu looked with especial predilection, for it could better satisfy his sacrificial wants than the Sāma-, and still more, of course, than the R'igveda. "The Yajurveda," says *Sāyan'a*, in his introduction to the *Taittiriya Saṁhitā*, "is like a wall, the two other Vedas like paintings (on it)." The sacredness of the Sāma- and Yajurveda, and the belief in their inspired character, rest on the assumption that they are of the same origin as the R'igveda, which dates from eternity, and which was "seen" by the R'ishis who uttered it. That, in the case of the Yajurveda, this theory is only partially correct, results already from the description just given of it; for whatever losses the present text of the R'igveda may have suffered, it is admitted by all authorities that its mantras were always metrical, and that it can never, therefore, have possessed passages in prose. But how frail this theory is, and in what sense it is possible to speak of the sameness of origin even in the case of those hymns of the Sāma- and Yajurveda which are composed of R'igveda verses, a comparison of the place occupied by the verses of a few hymns taken from one and the other of these Vedas with the place which the same verses occupy in the R'igveda, will sufficiently shew.

The first hymn of the Sāmaveda consists of ten verses, nine of which are contained in the present recension of the R'igveda. If by the side of each of these verses the place is marked which it holds in the R'igveda, the result is this:

Sāmaveda	1, verse	1, is	R'igveda,	Book.	Hymn.	Verse.
"	"	2,	"	6	16	10
"	"	3,	"	6	16	1
"	"	4,	"	1	12	1
"	"	5,	"	6	16	34
"	"	6,	"	8	78	1
"	"	7,	"	8	60	1
"	"	8,	"	6	16	16
"	"	9,	"	8	11	7
"	"	9,	"	6	16	18

The verses of which the hymn of the Sāmaveda 1, verses 370—380, is composed, correspond with the following verses of the R'igveda:

Sāmaveda 1, verse	370, with	R'igveda,	Book.	Hymn.	Verse.
"	"	371,	"	8	86
"	"	372,	"	10	147
"	"	373,	"	absent	
"	"	374,	"	1	57
"	"	375,	"	8	51
"	"	376,	"	10	48
"	"	377,	"	1	51
"	"	378,	"	1	52
"	"	379,	"	6	70
"	"	380,	"	10	134
"	"	381,	"	1	101

If from the White Yajurveda the mantras, for instance, of the 22d to the 26th chapter were submitted to a similar test, it would be seen that in chapter 22, which has 34 divisions, only four verses occur in the R'igveda, viz.:

	Book.	Hymn.	Vers.
White-Yajurveda 23, v. 10, in R'igv.	1	23	5
" " 16, "	5	14	1
" " 16, "	8	11	2
" " 18, "	9	110	8

that in chapter 23, with 65 divisions, there correspond :

	Book.	Hymn.	Vers.
White Yajurv. 23, v. 8, with R'igv.	10	121	8
" " 5, "	1	6	1
" " 6, "	1	6	2
" " 16, "	1	162	21
" " 32, "	4	39	6

that chapter 24 being in prose, cannot occur in the R'igveda; and that of chapter 25, with 47 divisions :

	Book.	Hymn.	Vers.
White Yajurv. 25, v. 12, in R'igv.	10	121	4
" " 18, "	10	121	2
" " 14-23, pro "	1	89	1-10
" " 24-45, "	1	163	1-23
" " 46, 10 "	10	157	1, 3, 2

(See the article "The Inspired Writings of Hinduism," in the "Westminster Review" for January 1864.)

All, therefore, that is left of the oldest Veda in the Sāmaveda and Yajurveda, is a R'igveda piece-meal; its hymns scattered about; verses of the same hymn transposed; verses from different hymns combined, and even the compositions of different poets brought into one and the same hymn, as if they belonged to the same authorship. That, under such treatment, the Yajurveda should have lost all poetical worth, is but what may be expected; it must be, however, matter of surprise that the Sāmaveda should have saved so much, as it even now possesses, of that genuine beauty which distinguishes the R'igveda poetry. The "Atharvaveda," too, is made up in a similar manner as the Yajurveda, with this difference only, that the additions in it to the garbled extracts from the R'igveda are more considerable than those in the Yajurveda. It is avowedly the latest Veda, and even its name, "Atharvaveda," as it was current already during the classical period of Sanscrit literature, does not yet occur in the oldest Upanishads (q. v.), where only the songs or revelations of the "Atharva-Angiras," or of the "Bhrigu-Angiras," apparently denoting this Veda, are spoken of. The Atharvaveda was not used, as Madhusūdana, in his treatise on Sanscrit Literature says, "for the sacrifice, but merely for appeasing evil influences, for insuring the success of sacrificial acts, for incantations, &c.;" but on this very ground, and perhaps on account of the mysteriousness which pervades its songs, it obtained, amongst certain schools, a degree of sanctity which even surpassed that of the older Vedas.

This being the general character of these four Vedas, a few remarks must here suffice to convey some idea of their special contents.

On the religious ideas expressed in the "R'igveda," a general account is given in the article INDIA, sec. Religion; see also, besides the deities mentioned there, and the articles referring to them, VARUN'A, VĀYU, and YAMA, and J. Muir's "Contributions to a Knowledge of Vedic Theogony and Mythology," in the "Journal of the Royal Asiatic Society" for 1864. The social condition of the Hindus, as reflected from the hymns of this Veda, is not that of a pastoral or nomadic people, as is sometimes supposed, but on the contrary, betrays an advanced stage of civilisation. Frequent allusion is made in them to towns and cities, to mighty kings, and their prodigious wealth. Besides agriculture, they mention various useful arts which were practised by the people, as the art of weaving, of melting precious metals, of fabricating cars, golden and iron mail, and golden ornaments. The employment of the needle and the use of musical instruments, are known to them. They also prove that the Hindus of that period were not only familiar with the ocean, but sometimes must have engaged in naval expeditions. They had some knowledge of medicine, and must have made some advance in astronomical compu-

tation, as mention is made of the adoption of an intercalary month, for the purpose of adjusting the solar and lunar years. Nor were they unacquainted with the vices of civilisation, for we read in these hymns of common women, of secret births, of gamblers and thieves. There is also a curious hymn, from which it would follow that even the complicated law of inheritance, which is one of the peculiarities of the existing Hindu law, was to some extent already in use at one of the periods of the R'igveda hymns. The institution of caste, however, seems at that time to have been unknown, for there is no evidence to prove that the names which at a later period were current for the distinction of caste, were employed in the same sense by the poets of these hymns.—See Wilson's "R'igveda," vol. i., re-edited by F. E. Hall, vols. ii., iii., and vol. iv., edited by E. B. Cowell (Lond. 1860—1866).

The only recension in which the Sanhitā of the R'igveda has been preserved to us, is that of the *S'ākāya* school; and the hymns themselves are arranged according to two methods, the one chiefly considering the material bulk, the other the authorship of the hymns. Both divisions, however, run parallel. According to the former, the whole Sanhitā consists of eight *Ashl'akas*, or eights; these, again, are divided into 64 *Adhyāyas*, or lessons; these into 2006 *Vargas*, or sections; and the *Vargas* into *R'icha*, or verses, the actual number of which is 10,417, but, according to the statement of native authorities, seems at some other time to have amounted to 10,616 or 10,622.—According to the other method, the Sanhitā is divided into ten *Man'dālas*, or "circles;" the *Man'dālas* into 88 *Anuvākas*, or "sections;" these into 1017, and 11 additional, i. e., into 1028 *Sūktas*, or "hymns," and the hymns into *R'icha*, or verses, the number of which coincides, of course, with that of the former arrangement. The number of *padas*, or words, in this Sanhitā is stated as being 153,826.

In eight out of the ten *Man'dālas*, the first hymn or hymns are addressed to *Agni*; the next hymn or hymns generally to *Indra*; and after these come hymns to the *Vi's'vā Devās*—the deities collectively—or hymns to other special deities. The eighth *Man'dāla* begins with hymns to *Indra*, and the ninth is chiefly devoted to *Soma*.

As for the authorship of the hymns, the second *Man'dāla* belongs chiefly to that of *Gr'itsamada*, the third chiefly to that of *Vi's'vāmītra*, and the fourth chiefly to that of *Vāmadeva*. The fifth was composed chiefly by *Attri* and members of his family; the sixth by *Bharadvāja* and members of his family; the seventh by *Vasish'tha* and his kin; the first, eighth, ninth, and tenth by various *R'ishis*. The text of the Sanhitā has been edited in Roman characters by Professor Th. Aufrecht (Berlin, 1861); and the text, with the commentary of *Sāyan'a*, is published by Professor Max Müller, there having already appeared vols. i.—iv. of this edition (Lond. 1849—1869). Of translations, that by the late Professor H. H. Wilson, which was left by him completed in manuscript, and of which 4 vols. have already appeared in print (see above), follows the commentary of *Sāyan'a*, based on Hindu tradition; that begun by Professor Benfey in the Journal "Orient und Occident," vols. i. and ii. (Göttingen, 1862—1864), is essentially speculative.

The *Brāhman'a* portion of the R'igveda is preserved in two works only—the "Aitareya *Brāhman'a*," which consists of eight *Panchikits*, or "pentades," each of these comprising five *Adhyāyas*, or "lessons," and all the *Adhyāyas* together, 255 *Khan'dās*, or "portions;" and the *S'āṅkhāyana*, or *Kaṇṣh'taki-Brāhman'a*, containing thirty *Adhyāyas*, also sub-divided into a number of *Khan'dās*. The following specimens, selected from the former, may illustrate the manner in which works of this category enjoin sacrificial rites and explain their secret meaning. The first relates to the ceremony of carrying the *Soma* (q. v.). "The king *Soma* lived among the *Gandharvas*. The gods and *R'ishis* deliberated as to how the king might be induced to return to them. *Vāch*, the goddess of speech, said: 'The *Gandharvas* lust after women. I (therefore) shall transform myself into a woman, and then you sell me to them (in exchange for *Soma*).' The gods answered: 'No! how may we live without thee?' She said: 'Sell me unto them; if you should want me, I shall return to you.' Thus they did. In the disguise of a big naked woman, she was sold (by the gods to the *Gandharvas*) in exchange for *Soma*. In imitation (of this precedent), men drive away an immaculate cow of one year's age, this being the price at which they purchase the king *Soma*. This cow may, however, be rebought; for *Vāch* returned to the gods. Hence the *Mantras*, after *Soma* has been bought, are to

be repeated with a low voice. After Soma has been bought, the goddess of speech is with the Gandharvas; but she returns as soon as the ceremony of carrying the sacred fire is performed."

The following are the speculations of this Brāhman'a on the *Yāpa*, or sacrificial post, and the meaning of the sacrificial animal.

"(The theologians) argue the question: Is the *Yāpa* to remain standing (before the fire; or is it to be thrown (into the fire)? (They answer:) For him who desires cattle, it may remain standing. (About this, the following legend is reported.) Once upon a time, cattle did not stand still to be taken by the gods for food. After having run away, the cattle stood still, and, turning towards the gods, said repeatedly: 'You shall not obtain us. No, no.' Thereupon the gods saw that *Yāpa*-wenpon which they erected. Thus they frightened the animals, which then returned to them. That is the reason that, up to this day, the sacrificial animals are turned towards the *Yāpa* (their head being bent towards the sacrificial post to which they are tied). Then they stood still to be taken by the gods for their food. . . . The man who is initiated (into the sacrificial mysteries) offers himself to all deities. Agni represents all deities, and Soma represents all deities. When the sacrificer offers the animal to Agni and Soma, he releases himself from being offered to all deities. Some say: 'The animal to be offered to Agni and Soma must be of two colors, because it belongs to two deities.' But this precept should not be attended to. A fat animal is to be sacrificed, because animals (compared to the sacrificer) are fat, and he (compared to them) is lean. When the animal is fat, the sacrificer thrives through its marrow. Some say: 'Do not eat of the animal offered to Agni and Soma. Who eats of this animal, eats human flesh, because the sacrificer releases himself (from being sacrificed) by means of the animal.' But this precept, too, should not be attended to. The animal offered to Agni and Soma was an offering to Indra, for Indra slew *Vr̥itra* through Agni and Soma. Both then said to him: 'Thou hast slain *Vr̥itra* through us; let us choose a boon from thee.' 'Choose yourselves,' answered he. But they chose this boon from him; and thus they receive (now as their food) the animal which is sacrificed the day previous to the Soma feast. This is their everlasting portion chosen by them; hence one ought to take pieces of it, and eat them.'—See M. Haug's edition and translation of the "Altareya Brāhman'a" (vol. ii. pp. 59, 78), vols. I, II. (Bombay, 1868).

The principal object for which the *Sāmaveda* was compiled is the performance of those sacrifices of which the juice of the Soma plant is the chief ingredient; and of such sacrifices the most important is the *Jyotishtoma*, which consists of seven stages: the *Agnishtoma*, *Atyagnishtoma*, *Ukthya*, *Shodas'ini*, *Atrāstra*, *Ap-toryāma*, and *Vājapeya*; but the performance of the *Agnishtoma* alone was considered obligatory for those who wished to derive the chief advantage accruing from the celebration of this grand ceremony; while its other six stages, though adding to the merits of the sacrificer, were deemed voluntary. At the performance of such Soma sacrifices, the verses of the *Sāmaveda* were intoned; and there are special song-books which teach the proper manner how to chant them. The *Sanhitā* of the *Sāmaveda* is preserved in two recensions: in that of the *Rāṇ'dyānyā*, and probably also the *Kauthuma* school. It consists of two parts: the first, the *Chhandograntha* also called *Archika*, or *Pārvarchika*, contains, in the present recension, 686 verses, which are arranged into 59 *Das'atī* or decades, these being divided into *Prapāt'hakas*, or chapters, and the latter, again, into *Arđhaprapāt'hakas*, or half-chapters. The second portion, called *Staubhika*, or *Uttarāgrantha*, or *Uttarārchika*, consists of 1225 verses, distributed over nine *Prapāt'hakas*, which, too, are subdivided into *Arđhaprapāt'hakas*. And there is this peculiarity in the *Uttarāgrantha*, that, being for the most part arranged according to triplets of verses, the first verse of these triplets is frequently one which also occurs in the *Archika* portion. It is then called the *Yoni*, or parent verse, because the subsequent two, the *Uttarā*, are symbolically its children, since they participate of all the modulations, stoppages, and other modifications which may occur in the chanting of the "parent" verse. These modulations, &c. are taught in the *Gāndas*, or song-books mentioned before, two of which, the *Veyogāna* and *Aran'yagāna*, relate to the *Archika*; and two others, the *Ukagana* and *Uhyagāna*, to the *Staubhika* part. The text of the *Sāmaveda*-

Sanhitā, in the Rān'āyanta recension, has been edited and translated by D. J. Stevenson (Lond. 1842—1843), and by Professor Th. Benfey (Leip. 1848).

The number of *Brāhman'as* relating to this Veda is, by the native authorities, given as eight; and their names are: the *Praud'ha*-, or *Panchavins'a*-the *Shad'vins'a*-, the *Sāmavidhī*-, or *Sāmavidhāna*-, the *Araheya*-, the *Devatādhyāya*-, the *Van's'a*-, the *Sanhitopaniṣad-Brāhmaṇa*; and the *Upaniṣad*, which probably is the *Chhāndogya-Upaniṣad*, and thus is ranked amongst the *Brāhman'as*. A later *Brāhman'a*, probably of modern date, and which is not mentioned by Sāyan'a, is the *Adbhuta-Brāhman'a*. The latter and the *Van'sa Brāhmaṇa*, have been edited by Professor A. Weber; the former in the "Indische Studien," vol. iv. (Berlin, 1858); the latter in the "Abhandlungen der königlichen Akademie der Wissenschaften zu Berlin" (1858).

The history of the Yajurveda differs in so far from that of the other Vedas, as it is marked by a dissension between its own schools far more important than the differences which separated the schools of each other Veda. It is known by the distinction between a Yajurveda, called the *Black*-, and another, called the *White-Yajurveda*. Tradition, especially that of the *Purān'as*, records a legend to account for it. *Vais'ampāyana*, it says, the disciple of Vyāsa, who had received from him the Yajurveda, once having committed an offence, desired his disciples to assist him in the performing of some expiatory act. One of these, however, *Yājñavalkya*, proposed that he should alone perform the whole rite; upon which, *Vais'ampāyana*, enraged at what he considered to be the arrogance of *Yājñavalkya*, uttered a curse on him, the effect of which was, that *Yājñavalkya* disgorged all the Yajus texts he had learned from *Vais'ampāyana*. The other disciples, having meanwhile been transformed into partridges (*tittir*), picked up these tainted texts, and retained them. Hence these texts are called *Taittirīyas*. But *Yājñavalkya*, desirous of obtaining other Yajus texts, devoutly prayed to the Sun, and had granted to him his wish—"to possess such texts as were not known to his teacher." And because the Sun on that occasion appeared to *Yājñavalkya* in the shape of a horse (*vāja*), those who studied these texts were called *Vājins*. That part of this legend was invented merely to account for the name of the *Taittirīyas*, after whom a *Sanhitā* and *Brāhman'a* of the Black Yajurveda, and for that of the *Vājasaneyins*, after whom the *Sanhitā* of the White Yajurveda is named, is clear enough. Nor is greater faith to be placed on it when it implies that the origin of this dissension ascended to the very oldest period of the Yajurveda; for there is strong reason to assume that the division took place even after the time of the grammarian Pāṇini (q. v.). See Goldstickler's "Pāṇini," p. 180, ff. But so much in it is consistent with truth—that the Black Yajurveda is the older of the two; that the White Yajurveda contains texts which are not in the Black; and that, compared to the motley character of the former, it looks "white," or orderly. This motley character of the Black Yajurveda, however, arises from the circumstance, that the distinction between a *Mantra* and *Brāhman'a* portion is not so clearly established in it as in the other Vedas; hymns and matter properly belonging to the *Brāhman'as* there being intermixed. This defect is remedied in the White Yajurveda; and it points, therefore, to a period when the material of the old Yajus was brought into a system consonant with prevalent theories, literary and ritual.

The contents of both divisions of the Yajurveda are similar in many respects. Two of the principal sacrifices of which they treat are the *Dars'apūrṇ'amaśa*, or the sacrifice to be performed at new and full moon, and the *Aś'vamedha*, or the horse-sacrifice, at the performance of which 603 animals of various descriptions, domestic and wild, were tied to 21 sacrificial posts. A *Purushamedha*, or man-sacrifice, unknown to the other Vedas, is also mentioned in it; its character, however, is symbolical.

The text of the Black Yajurveda is extant in the recension of two schools—that of *Apastamba*, to which the *Taittirīya Sanhitā* belongs, and, that of *Charaka*. The former, which is in course of publication—the first volume and part of the second having been already published, with the commentary of Mādhvāchārya (Sāyan'a), by Dr E. Roer and E. B. Cowell in the "Bibliotheca Indica" (Calcutta, 1880—1884)—consists of seven *Kāṇ'd'a*, or books, which comprise 44 *Prap'd'haka*, or chapters,

subdivided into 661 *Anuvākas*, or sections, and containing 2198 *Kāṇḍ'ikās*, or portions.

The *Vājasaneyi-Saṁhitā*, or the Saṁhitā of the White Yajurveda, exists in the recension of the *Mādhyaṇdina* and *Kāṇva* school. In the former—the text of which, apparently also with the commentary of *Mahādharma*, has been edited by Professor A. Weber (Berlin, 1852)—this Saṁhitā has 40 *Adhyāyas*, or books, subdivided into 303 *Anuvākas*, with 1975 *Kāṇḍ'ikās*.

The principal Brāhman'a of the Black Yajurveda is the *Taittirīya-Brāhman'a*, which, with the commentary of (Mādhava) Śāyan'a, is in the course of publication by Bhubo Rajendralāla Mitra—the first volume and part of the second having already appeared in print (Calcutta, 1860—1865) in the "Bibliotheca Indica." That of the White Yajurveda is the *Satapathic-Brāhman'a*, the most complete and systematic of all Brāhman'a's. Its text, with a semblance of the commentary of Śāyan'a, has been edited by Professor A. Weber (Berlin, 1855).

The Atharvaveda has no circle of sacrifices assigned to it. Its object is, as observed before, to teach how to appease, to bless, to curse, &c. "The most prominent characteristic feature of this Veda," Professor Whitney, one of its editors, remarks, "is the multitude of incantations which it contains; these are pronounced either by the person who is himself to be benefited, or, more often, by the sorcerer for him, and are directed to the procuring of the greatest variety of desirable ends. Most frequently, perhaps, long life, or recovery from grievous sickness, is the object sought; then a talisman, such as a necklace, is sometimes given, or, in very numerous cases, some plant endowed with marvellous virtues is to be the immediate external means of the cure; further, the attainment of wealth or power is aimed at, the downfall of enemies, increase in love or in play, the removal of petty pests, and so on, even down to the growth of hair on a bald pate."—"Journal of the American Oriental Society," vol. III. p. 308. It has been surmised (Müller's "Ancient Sanscrit Literature," p. 447, ff.) that the hymns of the Atharvaveda "formed an additional part of the sacrifice from a very early time, and that they were chiefly intended to counteract the influence of any untoward event that might happen during the sacrifice." This is possible; but the great importance which the adherents of this Veda themselves attach to it, is founded on other considerations than these. They argue, as appears from the treatise "*Ātharvan'arāhasya*," mentioned above, that the three other Vedas enable a man to fulfil the *dharma*, or religious law, but that the Atharva helps him to attain *mokṣha*, or eternal bliss. This doctrine is laid down, for instance, in the "*Chāṇḍīka Upaniṣad*" of this Veda, when it says: "Those Brāhmanas and others who know the science or the (gender) Brāhman contained in the "*Brahmaveda*," become merged in Brāhman;" and it is likewise inferred from other passages in the "*Saunaka Brāhman'a*." The name of *Brahmaveda* itself, by which this Veda is also frequently called, is therefore explained by them, not as implying the Veda which belongs to the province of the priest Brahman, but the Veda which contains the mysterious doctrine of Brahman, the supreme spirit, into which the human soul becomes finally absorbed. It is probable, therefore, that the very uselessness of the Atharvaveda for sacrificial purposes, and the reluctance which was felt to base its sanctity merely on its incantations and spells, invested it, in the mind of its followers, with a spiritual character, which was then fully developed in the numerous Upaniṣads (q. v.) now connected with it.

The text of the Atharvaveda is preserved only in the *Saunaka* school. Its Saṁhitā consists, in the present edition of it, of 20 *Kāṇḍ'as*, or books. Of these, the first 18 are subdivided into 34 *Prapāṭ'hikas*, or chapters, with, altogether, 94 *Anuvākas*, or sections, each containing a number of *mantras* (the 17th *Kāṇḍ'a* consisting of a single *Prapāṭ'hika*). The 19th *Kāṇḍ'a* is not divided into *Prapāṭ'hikas*, but into *Anuvākas*, of which it contains seven; and the 20th, likewise divided into *Anuvākas*, has nine, of which the third is subdivided into three *Paryāyas*.—The text of this Saṁhitā has been edited by Professors R. Roth and W. D. Whitney (Berlin, 1856).

The only existing Brāhman'a of this Veda is the *Saunaka*- or *Gopatha-Brāhman'a*. "That this Brāhman'a," Professor Müller observes, "was composed after the schism of the Charakas and Vājasaneyins, and after the completion of the *Vājasaneyi-Saṁhitā*, may be gathered from the fact, that where the first lines of the other Vedas are quoted in the *Gopatha*, the first line of the Yajurveda is taken from

the Vājasaneyins, and not from the Taittirīyins."—"Ancient Sanscrit Lit.," p. 452. Each of these Vedas received in time *Anukraman'is*, or indices, which give the first word of each hymn, the number of verses, the names of the deities, the name and family of the poets, and the metre of every verse. The principal treatise of this kind is the "Sarvānukraman'ī, or "The General Index," ascribed to the authorship of "S'aunaka." For the theosophical works which grew out of these Vedas, see the article UPANISHAD; and for the works which were composed in order to secure a correct reading and understanding of the Vedic texts, and a correct performing of sacrificial acts, see the article VEDĀṅGA.—At a later period the name of Veda was also bestowed on *Itihāsa*—legends or legendary works—and *Purāṇas* (q. v.), collectively; but in this sense it never obtained real currency. *Upavedas*, or minor Vedas, are also mentioned in the *Charan'avyūha* and other works, and explained by them in the following manner. The Upaveda of the R'igveda, they say, is the *Agurveda*, or the Veda on Medicine—probably the well-known works of Charaka and Suśruta; the Upaveda of the Yajurveda is the *Dhanurveda*, or the Veda on archery; the Upaveda of the Sāmaveda is the *Gāndhārvaveda*, on music; and the Upaveda of the Atharvaveda is the *S'ilpas'āstra*, a work on mechanical arts, or, according to others, the *Arthas'āstras*, works on practical subjects, comprising polity, mechanical science, the training of elephants and horses, and fencing.

In the preceding brief outline of the four Vedas, the question as to the date at which they were composed has not been raised, because in the present condition of Vedic philology, an answer to it could only be hypothetical. From astronomical facts, based on a statement in a Vaidik calendar, Colebrooke concluded that this calendar was written in the 14th c. before the Christian era ("Miscell. Essays," vol. i. pp. 109, 110); and though subsequent writers have questioned the full correctness of this conclusion, those most reliable nevertheless admit that the error, if any, could not lessen the antiquity of this calendar by more than 100 or 200 years. As this calendar must have been composed after the R'igveda had been arranged, and as such an arrangement itself must be posterior to the date of its last hymn, a full scope is left for imagination to fill up these intervals. But let it be understood that imagination alone would have to perform this task, since scientific research has as yet not yielded any means to check it, or prompt it on, as the case may be; nor is there any real prospect that future discoveries in Sanscrit literature will supply this want. A safer basis, however, may be looked for, if future research restricted itself to the question as to the *relative* age of these Vedic writings. Much valuable evidence has been already brought forward in this respect to prove that there are R'ishis ancient, and less ancient (see, for instance, J. Muir's "Original Sanscrit Texts," vol. ii. p. 203, ff.); that there are R'igveda hymns older than others (for instance, in Müller's "Ancient Sanscrit Literature"); but, on the other hand, much confusion has also been produced by starting a theory, that all the Brāhman'as belong to one period, and all the hymns to another period preceding it, of which, again, two stages were thought to be discernible, and by assigning dates to the Brāhman'a period, as well as to each of the two stages of the Mantra period. For, apart from the purely imaginary value of such dates, and apart from the circumstance, that no evidence whatever has as yet been brought forward to justify an assumption of only two stages of hymns, each of which would comprise only 200 years, it is clear that the similarity of subject-matter alone—such as it marks the literary character of the Brāhman'as—cannot be a criterion for determining that *all* the Brāhman'as must be more recent than *all* the Saṁhitās. That a Brāhman'a of the R'igveda must be posterior to those hymns of the R'igveda Saṁhitā which it mentions, but to those alone—again, that a Brāhman'a of the Sāmaveda must be younger than the hymns of the Sāmaveda on which it relies, and so on—cannot be matter of doubt; but as the Saṁhitā of the Sāmaveda, for instance, must be more recent than that of the R'igveda, and as no fact whatever has been adduced to show why the Altareya Brāhman'a, or other Brāhman'as of the R'igveda, could not have appeared before a Sāmaveda-Saṁhitā was made, and so forth in the case of the other Vedas, it follows that it would be entirely unsafe to infer that all the Brāhman'as must be more recent than all the Saṁhitās; nay, even that all the Brāhman'as must be later than *all* the hymns of the R'igveda, since not all of them need have existed before the oldest Brāhman'a of this Veda was composed. A result like this is, un-

happily, purely negative, but it may have the advantage of counselling caution and stimulating research.

VEDĀṅGA—from Veda (q. v.) and *aṅga*, limb; hence, literally, "the limb of (the body of) the Veda"—is the name of six Sanscrit works, the object of which is to teach how to read and understand correctly the Vedic texts, and how to apply them correctly to sacrificial purposes. Whether the number of these works was originally the same as it now is, and already was at the time of the Upanishads, may be doubtful. Tradition mentions the following Vedāṅgas: 1. "Śikṣā," or the science of proper pronunciation. It is represented by a short treatise of 25, or, in another recension, of 59 verses, which explains the nature of letters, accent, and pronunciation, and is ascribed to Pāṇini (q. v.). 2. "Chandas," or (a work on) metre, which is ascribed to Piṅgala. 3. "Vyākaraṇa," or grammar, by which native authorities understand the celebrated work of Pāṇini (q. v.); but never those short books, especially concerned in Vedic peculiarities, called Prātiśākhya, the existing representatives of which, in all probability, are posterior to Pāṇini (see Goldstücker's "Pāṇini," &c., p. 183, ff.). 4. "Nirukta" (q. v.). 5. "Jyotiṣa," or astronomy. "Its chief object is to convey such knowledge of the heavenly bodies as is necessary for fixing the days and hours of the Vedic sacrifices." 6. "Kalpa," or works on the Vedic ceremonial, which systematise the ritual taught by the Brāhmaṇa portion of the Veda, omitting, however, all legendary or mystical detail. They are composed in the Sūtra style. See SŪTRA. The Kalpa, or Śrauta, Sūtras belonging to the R̥gveda are the *Asvalāyana*-, *Sāṅkhya*-, and *Śaṇaka* Sūtras; those relating to the Sāmaveda, the *Maṇḍūkya*-, *Lṛtyāyana*-, and *Brāhmyāyana* Sūtras; those of the Black Yajurveda, the *Apastamba*-, *Baudhāyana*-, *Satyashadha*-, *Hiranyakeśin*-, *Mātara*-, *Kaṭha*-, and *Vārāha* Sūtras. The White Yajurveda has only one Kalpa, or Śrauta, Sūtra connected with it, the *Kātyāyana* Sūtra, and the Atharvaveda likewise only one, the *Kusika* Sūtra.—At a later period, these works were supplemented by a similar class of works, which, however, merely describe the domestic ceremonies, viz., "the marriage rite, the rites to be performed at the conception of a child, at various periods before his birth, at the time of his birth, the ceremony of naming the child, of carrying him out to see the sun, of feeding him, of cutting his hair, and lastly, of investing him as a student, and handing him to a guru, under whose care he is to study the sacred writings." Works of this kind are called *Gr̥hya-Sūtras* (from *gr̥ha*, house), and to these, again, were added the *Samayācārika-Sūtras* (from *samayācārika*, conventional practice), which treat of customs sanctioned by the practice of pious men, but not enjoined or expressly stated in the Gr̥hya-Sūtras. The two last classes of Sūtras, which are not comprised amongst the Kalpa works, then grew into the *Dharma-sūtras*, or law-books, of which that of *Manu* is the chief representative. (See Müller's "Ancient Sanscrit Literature," p. 108, ff.)

VEDĀNTA (from the Sanscrit *veda*, and *anta*, end; hence, literally, "the end or ultimate aim of the Vedas") is the second great division of the *Mīmāṃsā* (q. v.) school of Hindu philosophy. It is chiefly concerned in the investigation of *Brahman* (neuter), or the Supreme Spirit, and the relation in which the universe, and especially the human soul, stands to it; and in contradistinction from the *Pūrvaśi* *mīmāṃsā*, or the investigation (*mīmāṃsā*) of the former (*pūrva*) part of the Vedas—viz., the Sanhita, and especially the *Brāhmaṇas* (see VEDA)—which contain the *dharma*, or religious law (see MĪMANSA), it is also called *Uttara mīmāṃsā*, or the investigation (*mīmāṃsā*) of the latter (*uttara*) part of the Vedas—viz., *Aranyakas* and *Upanishads* (q. v.), which treat of (the neuter) *Brahman*, or the Supreme Spirit [not to be confounded with (the masculine) *Brāhmān*, or the god of the mythological *Trimūrti* (q. v.)]. Sometimes, the name given to it is *Sārāka-mīmāṃsā*, or the investigation of the soul (*sārāka*). In its method, the Vedānta differs from the Nyāya (see NYĀYA and VAIS̥ESHIKA) by endeavoring to explain the universe as a successive development from one ultimate source or principle—whereas the Nyāya, in both its divisions, treats of the objects of human knowledge, of which the universe is composed, under different topics, unconcerned about their mutual relation of effect and cause; and from the *Sāṅkhya* (see SĀṅKHYA and YOGA), it is distinct, inasmuch as that system is based on the assumption of a duality of principles whence the universe derives its origin.

The object-matter of the Vedānta is the proof that the universe emanates in a

successive development from a Supreme Spirit or soul, which is called *Brahman*, or *paramātmā*; that the human soul is therefore identical in origin with Brahman; that the worldly existence of the human soul is merely the result of its ignorance of this sameness between itself and the Supreme Spirit; and that its final liberation or freedom from Transmigration (q. v.) is attained by a removal of this ignorance, that is, by a proper understanding of the truth of the Vedānta doctrine.

According to this doctrine, *Brahman* (neuter) is both the efficient and material cause of the world, creator and creation, doer and deed. It is one, self-existent, supreme, as truth, wisdom, intelligence, and happiness; devoid of the three qualities, in the sense in which created beings possess them; and at the consummation of all things, the whole universe is resolved or absorbed into it. From Brahman individual souls emanate, as innumerable sparks issue from a blazing fire. The soul, therefore, is neither born, nor does it die; it is of divine substance, and as such, infinite, immortal, intelligent, sentient, true. Its separate existence, as distinct from Brahman, is the cause of its ignorance; and this ignorance, which consists in regarding the world as a reality capable of subsisting without Brahman, has a double power—that of enveloping and projecting. By means of the former, it makes the soul liable to mundane vicissitudes, as to the sensations of pleasure, pain, &c. The projective power of ignorance, when encompassing the soul in its fourth condition, or that of pure intellect (its other conditions are: waking, dreaming, and dreamless sleep) produces out of the darkness which then prevails the five subtle elements—viz., ether, which is the substratum of the quality sound; air, which arises from ether, the substratum of touch; from air, fire or light, the substratum of color; from light, water, the substratum of savor; and from water, earth, the substratum of smell. From these subtle elements are then produced seventeen subtle bodies and the five gross elements. The former, also called *śūkas'arīra*, because they are bodies (*ś'arīra*) which impart to existing beings their individual character (*śūka*), are the *five organs of perception*—viz., the organs of hearing, touch, sight, taste, and smell, which arise severally from the pure or inactive particles of each of the subtle elements; further, two intellectual organs, which are produced from the mingled pure, or inactive particles of the subtle elements—viz., *buddhi*, understanding, the function of which is to arrive at a certainty or conclusion, and *manas* (an organ of volition and imagination), the function of which consists in willing and doubting—thinking and referring the external objects to one's own self, being two functions common to both of them; lastly, the *five organs of action*—viz., the voice, the hands, the feet, the organ of excretion and that of generation, which are severally produced from the foul or active particles of each of the subtle elements; and the *five vital airs*, which are produced from the mingled foul or active particles of the subtle elements—viz., the air breathed forth, which has its place in the fore-part of the nose; the air breathed downwards, which has its place in the lower intestines; the air which circulates through the whole body; the ascending air, which has its place in the throat, and the descending air in the middle of the body, which causes assimilation and digestion of food, produces semen, excrements, &c. (Later Vedāntists assume ten such vital airs—viz., besides the foregoing, the airs which severally cause retching, winking, hunger, yawning, and fattening.) The five gross elements are the five subtle elements, when, according to a theory derived from a scriptural text, they have become so divided and combined that each of them retains a preponderant portion of itself, and consequently of the quality of which it is the substratum—as ether, of sound, &c.—and besides smaller portions of the other subtle elements, and the qualities of which they are the substrata. From these gross elements then arise the various (mythological) worlds, and this world too, with bodies which are distinguished as viviparous, or those produced from a womb, as men, beasts, &c.; oviparous, or those produced from an egg, as birds, snakes, &c.; those generated by "sweat" or hot moisture, as lice, gnats, &c.; and those germinating, as creepers, trees, &c. The soul, when existing in the body, is encased in a succession of "sheaths." The first or interior "sheath" consists of *buddhi*, associated with the organs of perception; the second, of *manas*, associated with the organs of action; and the third, of the vital airs together with the organs of action. These three "sheaths" constitute the subtle body of the soul, which attends the soul in its transmigrations; and the collective totality of such subtle bodies is the Supreme soul, as regarded in its relation to the world; when it is also called "the soul

which is the thread," or passes like the thread through the universe, or Hiran'ya-garbhā, or life. The fourth and exterior "sheath" of the soul is composed of the gross elements; and the collective aggregate of such gross bodies is the gross body of the deity. This whole development being the result of ignorance, the soul frees itself from its error by understanding that the different stages in which this development appears, do not represent real or absolute truth; and when its error has completely vanished, it ceases to be re-born, and becomes re-united with Brahman, whence it emanated. But since the means of arriving at a final deliverance can only be the complete mastery of the truths of the Vedānta, other means, such as the performance of sacrifices or other religious acts enjoined by the Vedas (q. v.), or the practice of Yoga (q. v.), cannot lead to the same result. They may be meritorious, and are even recommended as such, but can effect only an apparent liberation. Of this, there are two kinds: one liberation which is effected in lifetime, and enables a man to perform supernatural actions or wonders, as the evocation of the shades of progenitors, going anywhere at will, and similar feats; and another which takes place after death, and enables the soul, not divested of its subtle body, to reside in heaven; but after a time its effect ceases, and the soul has to renew its mundane existence. In order to fit the mind for meditating on these truths, various moral duties are enjoined, and various practices are recommended, especially by later Vedānta writers. Thus, the student of the Vedānta is told not to hurt a sentient being, to speak the truth, not to steal, to practise continence, and not to accept gifts; to remain pure and content, to do penance, and to study the Vedas; also to remain in certain postures, to practise various modes of suppressing his breath, and the like. These injunctions, however, are extraneous to the doctrine itself, and appear to be a compromise with the old orthodox faith, which requires the performance of religious acts, and a later stage of it, which favors such austere practices as are especially known by the name of Yoga (q. v.). The doctrine of *bhakti*, or faith, does not belong to the older Vedānta; it is, however, an interesting feature of the later periods of this philosophy; and the same observation applies to the doctrine of *Māyā*, or illusion, according to which the world has no reality whatever, but is merely the product of imagination; for the older Vedānta, as will have been seen, merely teaches that the world is not *the truth*, but does not deny its material reality.

The oldest work on this philosophy is attributed to *Bādarāyaṇ'a*, or *Vyāsa* (q. v.), and is written in the *Sūtra* (q. v.) style; it is called the *Brahma-Sūtra*; it consists of four *adhyāyas*, or lectures, each sub-divided into four *pādas*, or chapters; each *pāda* containing a number of *Sūtras*. The number of the latter is 553, and that of the *adhikaraṇ'a*s or topics treated in them 191. The most important commentary on this work is the *S'ārīrakamīmāṃsā-hāshya*, by *S'ankarāchārya* (q. v.); and this commentary, again, has been commented on by a great variety of writers. The text of the *Sūtras* and this commentary have been edited at Calc. 1818; and the text with this commentary, and a gloss on the latter, by Govindānanda, in the "Bibliotheca Indica," by Pandita Rāma Nārāyaṇ'a Vidyāraṭna, Calc. 1863. Of the great number of other commentaries on the *Brahma-Sūtras*, mention may be made only of that by *Rāmānuja* (q. v., under VAISEN'AVAS), and of a short but very lucid one, by "Anandapārāyaṇ'a/īromāṇiḥhat'ta," (edited at Calc., without date). Amongst elementary treatises on the Vedānta, the most popular is the "Vedāntasāra," by *Sadānanda*, which, with the commentary of "Rāmakrishṇ'a Tīrtha," has been edited at Calc. 1829, and with this and another commentary by *Nṛsiṃhasaṅkavallī*, at Calc. 1849. It has been edited and translated also by the late Dr J. R. Ballantyne ("A Lecture on the Vedānta, embracing the Text of the Vedānta Sāra," Allahabad, 1850), who also translated the beginning of the *Brahma-Sūtras*.—A very useful compendium of the *Adhikaraṇ'a*s, or topics, is the "Adhikaraṇ'amālā," by *Bhāratīrītha*, which with the commentary of "S'ri Anandachandra-Vedāntavāgela," has been edited, Calc. 1862, and as an appendix to the *Brahma-Sūtras*, with extracts from this commentary, in the "Bibliotheca Indica," 1863.

VEDETTES are mounted sentinels, placed about 100 yards in advance of the outposts of an army, to keep a strict watch upon the enemy's movements, and to signal immediately the approach of danger. They should be placed two together.

VEER, in Sailing, is to pass from one board to the other, by bringing the stern to windward. It is therefore the same action as *Gybing* (q. v.).

Vega
Vegetable

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VEGA, Garcilaso de la. See GARCILASO.

VEGA-CARPIO, Lope Felix de, a celebrated Spanish poet, was born at Madrid on the 25th November 1562. From his very infancy, he is said to have given promise of extraordinary talent. Like Pope, he "flipped in numbers." On the death of his father, the family, originally a good one, fell into great difficulties, and was broken up. The young Lope fell to the charge of his uncle, the Inquisitor, Miguel del Carpio, who spared no pains to give him a good education. He was sent to the Imperial College at Madrid, and seemed to be progressing quietly towards the holy state, to which, by his uncle, he was destined, when an odd whim struck the lad, and, being then fourteen, he went off on a roving expedition with a comrade. But he and his companion were speedily arrested as thieves on their trying to effect the sale of a chain of gold (probably stolen from Lope's uncle), and sent back to Madrid. The returning prodigal was but coolly received by his reverend relative, who declined to further concern himself with a nephew of such distinctly *lay* propensities. He, in consequence, became a soldier; and in 1577 served at Terceira against the Portuguese. After this, we find him taken in hand by Geronimo Maurique, Bishop of Avila, who sent him to finish his studies at the university of Alcala. Here he was again ripening for holy orders, and was nearly in fact ripe, when again the passion of the vagabond drove him out upon the world a pervert. For some time, at this period of his life, Lope disappears from public view; and probably his adventures were of the kind which a discreet biographer will always permit his hero to prosecute as far as possible in private. It is understood that in his dramatic romance, "Dorothea," he afterwards favored the world with a sketch of himself and of these his early experiences; and if this is in detail to be taken as history, Lope, on his own shewing, must have been no more a model of propriety than certain other great poets who might be named. Towards 1585, we find him again at Madrid, attached to the person of the young Duke of Alva, for whom he composed the piece entitled "Arcadia," a tedious pastoral, with verses interspersed, which only in detached passages displays his brilliant ability. About this time, he married a lady of condition, by name Isabella de Urbino; but his domestic felicity was speedily cut short by a misadventure. Having had some difference with a gentleman of court, he satirised him in a filthy ballad; and on finding that he took it amiss, gave him satisfaction by running him through the body. For this he was thrown into prison, and afterwards exiled to Valencia. He returned to Madrid as soon as he could with safety, and soon after lost his wife, whom he is said to have tenderly loved. Grief for her death, complicated with want of success in another of his little love-affairs, drove him to join the famous *Armada*, then being fitted out for the conquest of England. Through the perils of this disastrous expedition Lope came with a whole skin, and in 1590 was again safe in Madrid. A brother, to whom he was much attached, and who sailed as an officer in the same vessel, had not the same luck, but died during the voyage. It is a characteristic trait, that Lope—who, whatever else he may be doing, must always be conceived as flooding out continuous torrents of verse—composed, amid the distractions of tempest and battle, a long poem, the "Hermosura de Angelica," which, as a continuation of the "Orlando Furioso" of Ariosto, has found favor even with express admirers of that poet. Shortly after his return, he became secretary to the Marquis of Malpica, and subsequently to the Count of Lemos, whose service he quitted soon after his marriage, in 1597, to Donna Juana de Guardio, resolving thenceforward to trust solely to literature for his livelihood. This he could well do with every confidence, as already one of the most admired authors of the day, and by far the most popular dramatist. The years immediately succeeding, he himself frequently afterwards refers to as the happiest period of his life; but it was not of very long duration. At the age of seven, his son Carlos died; and soon after, in giving birth to a daughter, his wife also died. The double blow was severe. A mistress, indeed, remained to console him, Donna Maria de Luxan, by whom he had a boy and girl, the latter of whom, Marcela, was the most beloved of all his children. But he had no doubt got a little tired of Donna Maria; and about this time he began to turn his thoughts seriously to religion. Having had as much vice as he cared for, he considered he had reached the point in his career at which piety might begin to be prosecuted with advantage. Accordingly, after an interval of devout preparation, he became, in 1609, a priest of the order of St Francis. Of his zeal in

his new functions, there is evidence in the fact, that in January 1633, he took prominent part in the ceremony of burning a heretical brother of his order. As to his performance of priestly duty otherwise, strictly thus much is known, that, with his old unremitting assiduity, he continued to pour forth poems and dramas, not always of a clerical or decent kind. During his last years, he fell into a profound religious melancholy. Despite the decay of his strength, he was rigorous in keeping himself up to the severest mark of discipline; in particular, he scourged himself terribly. Finally, in the beginning of August 1635, he gave himself a scourging so terrible, that the walls of the chamber were found bespattered with his blood; and some days after he died of it, at the ripe age of 73. If the poet in his later days thus exercised a little severity with himself, we may allow him to have been the best judge as to how far the peccadillos of his earlier ones might deserve it.

Lope was the idol of his contemporaries; and on the fruit of his labor, he lived in Madrid in what might be called splendor, when the really far greater Cervantes was starving in the same street. To such an extent was the popular admiration of him carried, that his very name became a synonym of excellence; and people spoke of a Lope jewel, a Lope poem, or the like, as one of unsurpassable perfection. At this day, we smoke what, as a Lope (Lopez) cigar, is understood as of superior quality; and it seems not at all unlikely that the name is derived from the poet deceased some centuries. In one quality, at least, Lope must be held to have surpassed all other poets—his productiveness was something portentous, and without parallel. Setting aside his other multitudinous performances, the dramas on which his popularity mainly rested, and which have since perpetuated his fame, have been calculated to number not less than 1800. He himself, in one of his latest works, more modestly puts them at something over 1500, and assures us that to write a whole drama in a day was no unusual feat with him. Even if we suppose in this something of the fabulous, there remain in print between five and six hundred of these pieces, to testify to his enormous fecundity; and it is certain that many more of his plays were acted, which have not in this form survived. The quantity of his work considered, its quality is not much less surprising. His fertility of invention is marvellous; the ease and grace of his versification are unsurpassed in the language in which he writes; and his pieces, even when slight in substance, are instinct with life and dramatic movement. In deep and serious qualities he is deficient, on which ground he is now ranked below his immediate successor, and some time contemporary, Calderon. With this single exception, he remains, however, the chief ornament of the Spanish stage, and a not inconsiderable figure in the dramatic literature of the world. An intelligent and full survey of his works, so far as the infinity of them permits it to be full, will be found in Ticknor's "History of Spanish Literature," to which readers are referred.

VEGETABLE, in a scientific sense, is a term synonymous with plant. Organic nature is divided into the *Animal Kingdom* (q. v.) and the *Vegetable Kingdom*. See PLANT. The word vegetable is derived from the Latin *vegetus*, lively, or healthy. *Vegetation* is the term employed to denote the growth of plants.

VEGETABLE CHEMISTRY, or the Chemistry of Plants, is so extensive a subject that it is impossible here to give much more than an enunciation of the most important propositions, without entering into full proofs or details. On submitting to incineration a plant which has been dried at a moderate heat till it ceases to lose weight, we find that the residue, which consists of mineral salts and a little carbon, is much lighter than the original plant, the portion which is burned off, or apparently lost, corresponding to the organic constituents of the plant. Hence every plant, like every animal, is composed of *organic* and *inorganic* or *inorganic constituents*. While the mineral constituents of the plant are also found in the crust of the earth, the organic constituents are primarily formed in the plant itself from inorganic matters, viz., from *water*, *atmospheric air*, and the *soil*, which collectively may be termed the food of plants.

The following general principles may be laid down regarding the organic constituents which mainly contribute to form the bulk of the body of the plant. (1.) All organic constituents of plants contain *carbon*. (2.) All such organic constituents contain *hydrogen*. Some of them, as, for example, many *etheral* or *volatile oils*, consist solely of these two elements. (3.) The greater proportion of these com-

pounds contain *oxygen* in addition to the two preceding elements. To this class belong those constituents of plants which are at the same time of the most general diffusion and of the greatest physiological and economic importance; namely, the so-called *carbo-hydrates*, which consist of carbon combined with hydrogen and oxygen in the exact proportion in which the last two elements form water. Under this title are included cellulose, starch, gum, &c. Other organic constituents contain not only carbon with hydrogen and oxygen in the above ratio, but an excess of oxygen. In this category may be placed almost all the *organic acids*, many *etheral oils*, *waxes*, the *resins*, many of the so-called *glycosides*, and the *fats*. (4.) With the above elements, *nitrogen* is associated, to form two very important groups of constituents, viz., the *organic bases* or *alkaloids*, and the *albuminates* or *protein bodies*. Although the nitrogenous groups never form more than a small part of the mass of a plant, nitrogen is never altogether absent from a plant. (5.) In association with all the above-named elements, *sulphur* in small quantity is present in the albuminates of all plants; in association only with carbon and hydrogen, it occurs in oil of garlic and oil of asafetida; and when combined with carbon, hydrogen, and nitrogen, it has been as yet only found in oil of mustard. Whether *phosphorus* in very minute quantity occurs in any of the vegetable albuminates, is still uncertain.

The inorganic constituents which are found in the ashes of all plants are: *potash*, *soda*, *magnesia*, and *lime*, in combination with *phosphoric*, *sulphuric*, *hydrochloric*, and *carbonic acids*, and additionally, *iron*, *manganese*, and *silica*, with traces of *fluorine*; while the marine plants or sea-weeds contain also appreciable quantities of *bromine* and *iodine*. *Alumina* and *baryta* are also occasionally found, as also are *nitrates* in certain plants. The carbonates almost always found in the ash are, as is well known, for the most part formed by the action of the incineration upon the salts of the vegetable acids, such as the acetates, citrates, &c., and probably in some other respects, the arrangements of the constituents of the ash are not precisely identical with those of the mineral ingredients while existing in the actual plant. Amongst the most essential of the inorganic constituents is *water*, which acts as a solvent for the matters dissolved in the vegetable juices, and forms a very preponderating part of the mass, sometimes amounting to from 86 to 96 per cent of the whole plant. From the preceding remarks, it is obvious that the nutrition and development of plants is dependent on their absorbing *carbon-compounds*, *hydrogen-compounds*, *nitrogen-compounds*, *sulphur-compounds*, *water*, and such *inorganic compounds* as yield the necessary inorganic constituents in a form capable of assimilation; together with the presence of *oxygen*, which is required for the formation of organic oxygenous compounds.

The assimilation of *carbon* first claims our attention. The composition of the atmospheric air, from whatever part of the earth's surface it is taken, is, as is well known, constant, in so far as the relative volumes of oxygen and nitrogen are concerned; while the variations in the carbonic acid, except when there are obvious causes for an excess (as, for example, an over-crowded room), are very slight. And, as a general rule, deviate scarcely at all from 4 volumes in 10,000 of air. Yet causes disturbing this uniformity are perpetually at work. Professor Mulder, adopting Lavoisier's and Davy's experiments, according to which a man consumes about 26 cubic feet of oxygen in 24 hours (and later observers place the daily quantity at 45 cubic feet), calculated his yearly consumption at more than 9500 feet. Considering the enormous numbers of men and animals on the surface of the globe, and the lamps, fires, furnaces, &c. ever burning, the atmosphere would apparently soon cease to be fit for the support of life (1) in consequence of the great diminution of oxygen, a gas essential to life, and (2) in consequence of the great excess of carbonic acid, a gas deleterious to life. The cause of this marvellous uniformity of atmospheric air under these circumstances is that function of plants by which they absorb their carbon. It is to the experiments and observations of Priestley in 1771, Ingenhousz in 1776, Senebier in 1807, and many later observers, that we are indebted for the knowledge of the great general fact, that plants take up the carbonic acid from the air, reduce it in their organism, and retain the carbon for the composition of their own organisms, while they restore the oxygen gas to the atmosphere. It is chiefly by the leaves, which may be regarded as the respiratory organs, that this process is carried on. It is needless here to notice the questions as to whether it is only during light, or constantly, that these changes go on; whether different rays

of the spectrum act with more or less power in liberating the oxygen, &c. Independently of the proof afforded, for example, by placing green plants in a mixture of 70 parts of common air and 80 parts of carbonic acid, and finding that, in the course of four hours, the carbonic acid has been almost entirely replaced by oxygen, we have obvious evidence in the case of lichens growing on a naked rock, that the carbon which they contain must be obtained from the atmosphere. In the case of aquatic plants, the process is identical, the atmospheric air being dissolved in the water. Carbon, in some form of combination or other, probably forms about two-thirds of the weight of a dried plant. The assimilation of *hydrogen* from the decomposition of water in and by the plant, is not capable of the same direct proof as that of carbon; but there are strong grounds for believing in its occurrence. This view is supported by the composition of wax, the resins, volatile oils, &c., and indeed it is difficult to see from what other source the hydrogen could be derived. In that case, the water, like the carbonic acid, contributes its oxygen to the air. The *nitrogen*, which enters into certain constituents of plants, is derived from ammonia, and not, as might have been supposed, directly from the air, of the volume of which it forms about four-fifths. It has been shewn by the direct observations of Boussingault, that plants cannot assimilate nitrogen, that those which have been made to absorb it by placing their roots in nitrogenous water, throw it off unchanged, and that vegetation cannot exist in a soil which contains no substances readily convertible into ammonia. The indifference of nitrogen to other elements, and the extreme readiness with which ammonia becomes decomposed, and enters into different combinations (the amides, imides, amido-acids, compound ammonias, and probably also the albuminates, being derivatives of it), together with the conclusion we draw from the action of liquids containing ammonia, or matter convertible into it, as gas-liquid, fluid sewage, &c., confirm this view. The ammonia taken up by plants is obtained partly from the air, and partly from the soil. In the air it is formed after thunder-storms, and it is further supplied to the atmosphere by putrefactive processes, animal excretions, and volcanic action. It is indeed found in snow and in all rain-water, and is thus conveyed to the soil. Although direct experiments shew that the air contained in the pores of the soil is richer in ammonia than ordinary atmospheric air, it is easy to shew that a plant can derive its ammonia from the latter alone, by a reference to the vegetation on naked rocks, or by growing plants in powdered charcoal duly moistened with rain-water. Hence both air and soil contribute the ammonia from which the nitrogen is fixed in the plant. The *oxygen* which occurs in the various constituents of the plant is derived from the decomposed carbonic acid and water, and corresponds to the difference between the amount contained in those absorbed compounds and the amount liberated to the atmosphere. The *sulphur* that occurs in the albuminates and certain etheral oils, must be derived from the soil, since it does not occur either free or in combination in the air; and as the only form in which it is found in common soil is as sulphates, plants must have the property of decomposing these salts, and appropriating their sulphur after reduction. Extensive experience has proved that certain *inorganic constituents* are as indispensable to the life and development of the plant, as the organic elements we have been considering; and further, that special plants require special inorganic constituents, as is shewn in works on agricultural chemistry. The two following facts seem well established; (1) that the roots of plants exert a special selective power, and absorb some salts, and reject others that are also in solution in the water of the soil; and (2) that the top or vegetable soil has the power of absorbing and retaining the most necessary mineral ingredients, and does not allow them to be carried deep into the ground by the rain; but for the discussion of this subject, we can only refer to the experimental researches of Liebig, Mulder, Huxtable, Way, &c. It would be altogether out of place to enter into the consideration of the prodigious synthetic and analytic power of the vegetable cells; we shall merely indicate how some of the most important vegetable compounds are probably formed; beginning with the *vegetable acids*. "Even," says Professor Gregory, "when carbonic acid and water are brought together in the cell, this is not enough. There must be present, first, albuminous matter, without which no active cell can exist; secondly, mineral matter, especially alkalies, phosphates, and salts. All these conditions being fulfilled, and light being admitted, we may suppose the first organic

acid formed to be oxalic acid, the least complex of all."—"Organic Chemistry," 4th ed. p. 541. Putting it in the briefest terms, the cell separates 2 equivalents of oxygen from 2 equivalents of carbonic acid, and yields 1 equivalent of *anhydrous oxalic acid*, or $C_2O_3 - O_2 = C_2O_2$. Two equivalents of dry oxalic acid, $C_2H_2O_4$, by taking up 2 equivalents of water, and losing 8 equivalents of oxygen, yield *hydrated malic acid*, $C_4H_6O_{10}$. *Tartaric* and *citric acids* are capable of a similar production. Thus, 2 equivalents of dry oxalic acid, combining with 2 of water, and losing 6 of oxygen, yield hydrated tartaric acid ($C_4H_4O_{12}$, or $C_4H_4O_{10} \cdot 2HO$); and similarly, 8 equivalents of dry oxalic acid, combining with 2 of water, and losing 12 of oxygen, yield hydrated citric acid ($C_{12}H_8O_{14}$, or $C_{12}H_8O_{11} \cdot 3HO$). In like manner, every vegetable acid, and every one of the neutral compounds of carbon, hydrogen, and oxygen, may be derived from some less complex compound, containing more hydrogen than itself; or it may be supposed to be derived directly from carbonic acid and water, oxygen being, on every supposition, given off. "As the proportion of oxygen to carbon diminishes, the acids become weaker, till the oxygen exactly suffices to form water with the hydrogen, when we have either very feeble acids, or neutral bodies, such as sugar, gum, and starch. As the oxygen is still further diminished, we have neutral, bitter, and acrid compounds, or colored bodies, or such as yield coloring matters, with ammonia and oxygen; further on still, we have aromatic oils, and volatile, quasi-resinous, crystallisable acids; then resins; and lastly, when all the oxygen is expelled, certain oils, which are carbo-hydrogens." Gregory, *op. cit.*, p. 545. Although each individual substance is doubtless in reality derived from some substance only a little less complicated than itself, the final result, in so far as shewing their mode of construction is concerned, is the same as if they were all obtained directly from carbonic acid and water. The following tabular view (compiled by Gregory) will serve to shew how all the leading groups of vegetable compounds are produced from carbonic acid and water by deoxidation:

SUBSTANCES FORMED.

Name.	Formula.	= Carbonic Acid.	+ Water	= Oxygen.
1. Vegetable Acids—				
Tartaric acid.....	$C_4H_4O_{12}$	=	$8CO_2$ +	6HO — 100
Malic acid.....	$C_4H_6O_{10}$	=	$8CO_2$ +	6HO — 120
Citric acid.....	$C_{12}H_8O_{14}$	=	$12CO_2$ +	8HO — 180
2. Carbo-hydrates—				
Cellulose.....	$C_{12}H_{10}O_{10}$	=	$12CO_2$ +	10HO — 240
Starch.....	$C_{12}H_{10}O_{10}$	=	$12CO_2$ +	10HO — 240
Cane-sugar.....	$C_{12}H_{11}O_{11}$	=	$12CO_2$ +	11HO — 240
3. Other Neutral Bodies*—				
Mannite.....	$C_{12}H_{14}O_{12}$	=	$12CO_2$ +	14HO — 260
Salicine.....	$C_{26}H_{18}O_{14}$	=	$26CO_2$ +	18HO — 560
Pectine.....	$C_{26}H_{21}O_{24}$	=	$26CO_2$ +	21HO — 630
Hæmatoxyline.....	$C_{22}H_{14}O_{12}$	=	$22CO_2$ +	14HO — 660
Elaeterine.....	$C_{60}H_{26}O_{18}$	=	$60CO_2$ +	26HO — 1370
4. Oxygenated Volatile Oils, and Allied Acids—				
Oil of Bitter Almonds.....	$C_{14}H_8O_2$	=	$14CO_2$ +	6HO — 320
Benzolic acid.....	$C_{14}H_8O_4$	=	$14CO_2$ +	6HO — 300
Oil of Cinnamon.....	$C_{18}H_8O_2$	=	$18CO_2$ +	8HO — 420
Cinnamic acid.....	$C_{18}H_8O_4$	=	$18CO_2$ +	8HO — 400

* In this group, which is very numerous, compounds of a most discordant character appear. Of the specimens we have selected, the first closely resembles a sugar; the second is a pure bitter; the third, a gelatinising substance; the fourth, a pigment; and the fifth, an acrid poison.

5. *Oily and Fatty Acids*—

Acetic acid.....	$C_2H_4O_2$	=	$8CO_2$	+	$4HO$	—	800
Butyric acid.....	$C_4H_8O_2$	=	$8CO_2$	+	$8HO$	—	200
Valerianic acid.....	$C_{10}H_{10}O_4$	=	$10CO_2$	+	$10HO$	—	260
Stearic acid.....	$C_{36}H_{72}O_4$	=	$36CO_2$	+	$36HO$	—	1040

6. *Resins and Camphors*—

Many Resins.....	$C_{10}H_7O$	=	$10CO_2$	+	$7HO$	—	260
Camphor.....	$C_{10}H_8O$	=	$10CO_2$	+	$8HO$	—	270
Borneo Camphor.....	$C_{20}H_{16}O_{2.1}$	=	$20CO_2$	+	$18HO$	—	560

7. *Carbo-hydrogens*—

Oil of Lemons....	C_8H_4	=	$5CO_2$	+	$4HO$	—	140
Oil of Turpentine.....	$C_{10}H_8$	=	$10CO_2$	+	$8HO$	—	280
Oil of Juniper.....	$C_{15}H_{12}$	=	$15CO_2$	+	$12HO$	—	420
Cumole.....	$C_{10}H_{12}$	=	$18CO_2$	+	$12HO$	—	450
Cymole.....	$C_{20}H_{14}$	=	$20CO_2$	+	$14HO$	—	540

A glance at the composition of these seven groups shows that they present a series of deoxidations, till in the sixth, very little oxygen, and in the last, no oxygen whatever is left. Thus, leaving out of view, for want of space, the compounds in which nitrogen and sulphur enter, "oxalic acid is first formed, and then malic, tartaric, citric, &c. acids from it, or from each other; then sugar, starch, &c. from the acids; bitter, acrid, and colored compounds from the sugar, starch, &c.; then oxygenated volatile oils; and then acids perhaps also from sugar, &c.; then the oily and fatty acids, either from the preceding oils and acids, or from sugar; then the resins from the fats, or from sugar; and lastly, the carbo-hydrogens." Thus, we have a picture of the whole process of vegetation as far as concerns compounds devoid of nitrogen and sulphur; and we find it uniformly to be one of deoxidation."—Gregory, *op. cit.*, p. 548. To produce nitrogenous compounds, such as asparagine, amygdaline, nicotine, morphine, caffeine, &c., it is only additionally necessary that ammonia should be present, and the plant by a similar process gives rise to nitrogenous products, the process being shewn as below:

Asparagine.....	$C_8N_2H_{10}O_8$	=	$8CO_2$	+	$4HO$	+	$2NH_3$	—	120
Amygdaline.....	$C_{40}N_2H_8O_8$	=	$40CO_2$	+	$24HO$	+	NH_3	—	820
Nicotine.....	$C_{20}N_2H_{14}$	=	$20CO_2$	+	$8HO$	+	$2NH_3$	—	480
Morphine.....	$C_{24}N_2H_{19}O_6$	=	$34CO_2$	+	$16HO$	+	NH_3	—	800
Caffeine.....	$C_{16}N_4H_{10}O_4$	=	$16CO_2$			+	$4NH_3$	—	250

It is easy to shew how the sulphur contained in certain oils (oil of garlic, C_6H_8S , for example) is probably obtained by the reduction of the sulphuric acid existing in the sulphates of the soil; but the composition of the albuminates containing both sulphur and nitrogen is so complex that we cannot venture to attempt a popular explanation of the mode of formation of these matters from the simple food of plants.—On this subject, the reader may consult Liebig's "Agricultural Chemistry," "Letters on Chemistry," and "Laws of Hæmabdry;" Mulder's various works (a new edition of his great work is now being translated, in parts, into German); Rochleder's "Phytochemie," and the portion of Gregory's "Organic Chemistry," and of the third volume of Gopp-Schaeffer's "Handbuch der Chemie," devoted to this question.

VEGETABLE IVORY. See IVORY, VEGETABLE.

VEGETABLE MARROW. See GOURD.

VEGETABLE PARCHMENT. See PARCHMENT, VEGETABLE.

VEGETABLE PHYSIOLOGY. All the most important departments of this subject have been already noticed in this work under the various headings of

CIRCULATION OF SAP, FLOWER, FRUIT, LEAVES, METAMORPHOSIS OF ORGANS, PLANT, ROOT, SEED, SPORE, STEM, &c. We shall therefore here only discuss one subject, which has not been separately considered—namely, the organs and functions of reproduction in plants. Although, as we learn from Herodotus, the Babylonians knew that there were male and female date-trees, and that the female required the concurrence of the male to become fertile, and Theophrastus, in his work "On the History of Plants," and other ancient authors, frequently mention the sexes of plants, Cæsalpinus, who died at Rome in 1603, seems to have been the first writer who directed his attention to the reproductive organs of plants; and he speaks vaguely of an emanation from the male causing fertility in the female; and Grew, in 1676, seems to have been the first who distinctly recognised the functions of the stamens and pistils. Ray, in his "Historia Plantarum," 1694, adopted and enforced Grew's view; and Geoffroy, in 1711, read a Memoir before the Royal Academy supporting the same view. Linnæus, in his "Systema Nature" (1748), made these organs the foundation of his system of classification into sexual and non-sexual plants, the former being phanerogamous, or flowering, and the latter cryptogamous, or flowerless; in the latter division of plants, he could not detect stamens or pistils; and it was not till 1782, when Hedwig's work on Mosses was published, that anything was known with certainty regarding the sexual organs of any of the cryptogamia. From this brief notice of the early history of this subject, we proceed to the consideration of reproduction in the phanerogamous plants. A complete flower consists, as is well known, of four whorls (*verticils*), placed alternately within one another, the two internal being the *Stamens* (q. v.) and *Pistils* (q. v.), which are the essential organs of reproduction; while the two external are the *calyx* and *corolla*, which constitute the floral envelopes or protective coverings. Both the stamens and the pistils originate, like the floral envelopes (see *FLOWER*), from the thalamus, or upper part of the axis or peduncle, in the form of minute cellular processes; and in their development they resemble leaves, although, in their appearance, they are less like leaves than are the floral envelopes. These parts are well seen in the following diagram (fig. 1) of the flower of the vine, after it has cast its petals. There are here five stamens (the filament of one being concealed by the pistil), with introrse* two-lobed anthers. As separate articles are devoted to *STAMENS* and *PISTILS*, it is unnecessary to enter into any details regarding their anatomical structure. A few additional remarks on the pollen are, however, called for. This (the male fertilising agent) consists of cells contained in the anther case, and is discharged by various kinds of longitudinal, transverse, valvular, or porous dehiscence. When examined by the naked eye, it usually appears as a yellow powder; but when magnified, it is found to consist of cellulæ of different singular forms, varying in size from 1-800th to 1-700th of an inch in diameter. Oval, spherical, and triangular forms of pollen are shewn in figs. 2 to 6; and they may be square, cylindrical, hour-glass shaped, &c. These pollen-grains are developed in the large cells in the early stage of the anther. The contents of each cell divide first into two, and afterwards into four parts, each of which becomes covered with cellulose, so as to constitute independent cells or grains. These grains either burst through the parent cell, and become liberated, or they remain united in fours or some multiple of four, as in many species of acacia; or in large masses, such as those seen in Orchids and in Asclepias, when they constitute *pollinia*. Each pollen-grain has usually two coverings: the outer one, called *ectine*, being a firm membrane, often marked with bands or rough points; and the inner one called

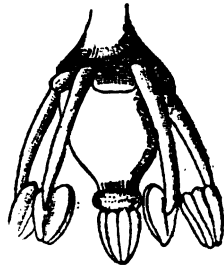


Fig. 1.
Androecium and Gynoecium
(or, in other words, the
stamens and pistil) of the
Vine, with the disc surround-
ing the base of the ovary.

* This term is applied to anthers which open on the side next the pistil.

intine, which is thin, and capable of extension. In the interior of the pollen-grains, a minute granular matter exists, called *fovilla*—the granules, which are mixed with starch and oil, varying from 1-4000 to 1-30,000 of an inch in diameter. On moistening pollen-grains in water, they swell till the *intine* bursts at one or more points, and expels the *fovilla*. In the act of impregnation, the pollen is scattered on the pistil, and is moistened on one side by the fluid of the stigma (a part of the pistil composed of loose cells, which secrete a viscid fluid, and are uncovered by epidermis). It is then observed that the *intine*, instead of bursting, protrudes in the form of a tube called the *pollen-tube*. The number of these tubes varies greatly in different plants. According to Amici (as quoted by Balfour, to whose useful *Class-book* we are indebted for most of our facts and illustrations), the two pollinia of *Orchis morio* contain each about 200 secondary small masses, composed of grains united in fours, and each of these small masses presents 500 openings capable of emitting tubes.

In order that an embryo plant may be formed, the mature pollen must be discharged from the anther cells of the stamen, and brought into contact with the stigma, through which, and then through the conducting tissue of the style, it must pass until it reaches the foramen, or micropyle, of the ovule. The means by which this contact is accomplished are various, such as elasticity and irritability of the stamens, the action of currents of air, and the intervention of insects passing from the male to the female plant. In the case of the orchids, fertilisation is solely effected by the agency of insects. The fertilising power of pollen is retained for a different length of time in different plants: thus, while in most species of *Datura*, and in *Lychnis dioica*, it loses its power in two days, in the wall-flower it remains efficacious for 14 days; while in the date, cannabis, tea, and camellia, it will keep fresh for a year; indeed, Michaux mentions that the pollen of the date has been successfully used after 18 years! The quantity of pollen that is produced is much greater than is actually required for the impregnation of the ovules. Thus, in the Fir and Pine, the quantity is enormous, probably because of the obstacles here presented to fertilisation. The sulphur

showers occurring in some districts are composed of the yellow pollen carried by the winds from pine-forests; and the showers of colored rain which are occasionally noticed are due to a similar cause. The number of pollen-grains in certain flowers has been calculated. In a plant of *Cereus grandiflorus*, Morren observed that there were 40 flowers, each containing 500 stamens, and that each anther contained 500 pollen-grains; hence the entire number of pollen-grains in each flower was 250,000, and in the whole plant is 10,000,000. Similarly, in an entire Rhododendron plant, the pollen-grains amount to 73,620,000. The quantity required for fertilisation is very small—one, two, or at most three grains, being sufficient to impregnate one ovule. In most cases, the pollen of a single anther is sufficient for complete impregnation; the additional anthers being, as it were, added for the purpose of insuring the result. During the evolution of the stamens, and the maturation of the pollen, the pistil undergoes certain changes, of which the most important is that the stigma becomes

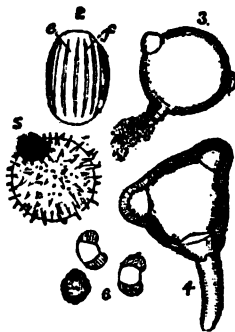


Fig. 2.—Elliptical Pollen of Milk-work (*Polygala*), viewed lengthwise. Its surface, or *extine*, *e*, is marked with grooves or alts, *f*, where the *intine* protrudes. Fig. 3.—Round Pollen of Cherry (*Cereus*) discharging its *fovilla* through a tubular opening formed by the *intine*. There are two other points at which the *intine* is seen protruding. Fig. 4.—Triangular Pollen of Evening Primrose (*Eranthis*), with one pollen tube protruding. This tube is formed by the *intine*, which is also seen projecting at the other angles. Fig. 5.—Round ripe Pollen of Hollyhock (*Ailce*), with its *extine* covered with prominent points. Fig. 6.—Pollen of Fir (*Pinus*), in which, by the increase of the *intine*, the *extine* is separated into two hemi-spherical portions marked by the dark spaces at each end of the grains.

enlarged, lax, and covered with a viscid secretion, which, besides detaining the pollen-grains, causes them to protrude their tubes, as already described; moreover, in some flowers, the style, which is sometimes covered with hairs, elongates during the discharge of the pollen, brushes the latter on to the pistil, and thus acts directly in fecundation. One of the central cells of the ovule now becomes much enlarged and developed, so as to form the embryo sac. At the end of this sac, next to the micropyle, several free nucleated cells are formed, to which the name of embryo vesicles, or germinal vesicles, has been given. In this way, the ovule is prepared for the action of the pollen, and for the production of the embryo plant. The tubes developed by the pollen-grains, when acted on by the secretion of the stigma, pierce the stigmatic tissue, and carry the fovilla through the canal of the style to the ovule. In some plants, the emission of tubes begins in half a minute after the pollen has been caught by the stigmatic secretion; in other cases, it does not begin for 24 hours or more; and it is said that in the larch, the tubes do not emerge for 85 days. The length to which the tubes extend is often very great, but the diameter is extremely small. In *Colchicum autumnale*, in which the style is 13 inches long, the length of the tube is 9000 times the diameter of the grain from which it proceeds. The time taken by the tube to traverse the length of the style, varies, but does not always correspond with the latter. In some short-styled plants, the time is very long, while in the long-styled *Colchicum autumnale*, the pollen-tube reaches the ovule in about 12 hours. In some coniferous plants, a year is required for the process.

We now proceed to consider the embryogeny of (1) Gymnosperms and (2) Angiosperms Phanerogams. In the gymnosperms or naked-seeded flowering-plants, such as the conifers and cycadaceæ, impregnation is effected by direct contact between the pollen and the ovule, there being no true ovary bearing a stigma. The process is thus summarised by Balfour: "In gymnospermous plants, there are stamens containing pollen, and ovules supported on cones or altered branches, and in them the pollen enters the large micropyle of the ovule without the intervention of stigma or style. When the pollen reaches the nucleus of the naked ovule, it remains long dormant, and after many weeks and months, sends out a tube which reaches the embryo sac, and impregnates a corpuscle. One of the cells of the corpuscle then takes an active function, and develops the embryo with the suspensor in the midst of endospermial cells."—*Op. cit.*, p. 600. In the angiospermous phanerogams, when the pollen-tube has traversed the tissue of the style, and reached the ovule, it proceeds through the foramen, or micropyle, so as to come in contact with the embryo sac; and consequent on this is the development of the cellular embryo. There is, however, much dispute as to what now occurs. "Schleiden thinks that the end of the pollen-tube introverts the embryo sac, and in some cases perforates it, and that it becomes the first cell in the embryo. Most physiologists, however, agree in thinking that Schleiden was mistaken in regard to the extremity of the pollen-tube, and they believe that the embryo is formed from a distinct cell previously existing in the embryo sac. In some instances, the pollen-tube indents the embryo sac, at other times it perforates it, and comes into actual contact with a cell contained in the sac. In the embryo sac there are produced, before impregnation, certain cells, often three, which are called germinal vesicles, only one of which in general is impregnated by the pollinic fluid, which transudes through the membrane of the pollen-tube and the walls of the embryo sac and vesicles. After impregnation, the vesicle divides by a transverse septum into two parts, the upper portion forming a coniferoid partitioned filament or suspensor, and the lower becomes filled with cells, constituting the rudimentary embryo. The suspensor is attached to the part which forms the radicle of the embryo, and at the opposite end, one or two cotyledons are produced, enclosing the fresh bud or plumule. An embryo is usually produced in each ovule (monembryony); but when more than one germinal vesicle is impregnated, there is a plurality of embryos (polyembryony). When the pollen of one species is applied to the pistil of another species, we occasionally find seeds produced which give rise to individuals intermediate between the two parents: these individuals are called hybrids or mules, and are rarely fertile. A plant has, however, a preference for the pollen of its own species, and hence hybrids are rare in nature."—Balfour, *op. cit.*, p. 600. The suspensor is sometimes of considerable length, and as much as three, or even five times the length of the whole seed. In monocotyledons, a single sheathing cotyledon is developed; in dicotyledons, two

opposite leaves; and after their formation, the apex produces the terminal bud or plumule. The embryo is thus suspended in an inverted position in the seed.

It is impossible to enter into any general description of the organs or process of reproduction in cryptogamic plants. In this great division of the vegetable kingdom, the organs of reproduction are in general obscure, and consist usually of cellular sacs of two kinds—one being called *antheridia*, containing *phytozoa* or *spermatozoids*, representing the stamens, or the male; and the other being called *pistillidia* or *archegonia*, and representing the pistil, or the female. In the fully developed state of the plant, the antheridia disappear, while the pistillidia are transformed into cellular sacs containing germinating bodies known as Spores (q. v.), which are considered as being formed by a process of reproduction, and as being analogous to cellular embryos. These spores are developed in mother-cells, the contents of which often divide into four, such mother-cells being called *sporidia*. With regard to the antheridia and the pistillidia in the different orders of cryptogamic plants, Dr Balfour observes that in ferns they are supposed to exist in a pro-thallus or cellular expansion produced by the spore when it germinates. A cell of the pistillidium (the ovular body) afterwards gives rise to the spore-bearing leaves (the fronds). After impregnation, the archegonial cells give rise to a sporiferous frond. The spores are contained in sporangia, with or without an elastic ring, developed on the back, on the side, or at the base of the leaves. In mosses, these organs are seen at certain stages of the plant's growth, and they are either on the same or on different plants. After impregnation, the archegonial cell gives rise to a stalked theca or sporangium with its spores. In liverworts, they are usually on different parts of the plant, and as frequently in the substance or on the under surface of disc-shaped cellular stalked expansions. Here the impregnated cell gives rise to the fruit or capsules. In lichens, the existence of these organs has not been already established; and the fructification consists of *thecæ* or *acæ*, containing 4, 8, 12, or 16 sporidia (or cells containing spores) in their interior. These thecæ are usually united together so as to form a cup-like mass of fructification. When mature, the sporidia or thecæ burst, and discharge the spores. The fungi, antheridia, and pistillidia are obscure, and the organs of reproduction are spores which are either naked or are contained in them. In algae, antheridia and pistillidia have often been detected; but in some of them, certain cells; in the same or separate filaments, seem to possess the property of producing spores by a process of conjugation or union; and in the lowest forms the cells undergo division into new individuals.

Besides the above-noticed modes of propagation, cryptogamic plants are also propagated by buds or gemmæ, which are either attached to the leaves or fronds, or are contained in peculiar cup-shaped bodies.—See Carpenter's "General and Comparative Anatomy," and Balfour's "Class-book of Botany," from which we have borrowed freely.

VEGETABLE TISSUE, the term employed in Botany to denote the whole substance of which plants consist; regarded according to its structure, rather than to functions or chemical composition. See **CELLULAR TISSUE** and **VASCULAR TISSUE**.

VEGETARIANISM, the doctrine that vegetable substances are the solids intended by nature for the sustenance of man, and that it is wrong—against nature and against good morals—for men to make use of an animal diet. There have never been wanting among speculative persons some who maintained that fruits and vegetables are the proper food for men; and illustrious names, such as those of Pythagoras, Plato, Plutarch, in ancient times—of Rousseau, Shelley, Swedenborg, in modern, can be counted among the upholders of this doctrine. A society for promoting the practice of vegetarianism was established at Manchester in 1847; and three years later, a similar society was established in the United States. Besides a short-lived publication called the "Vegetarian Advocate," the vegetarians in Great Britain have been represented by the "Vegetarian Messenger" (monthly), from 1849 to 1859; for one year by the "Journal of Health;" from 1861 to 1871 by the "Dietetic Reformer and Vegetarian Messenger" (quarterly); and since 1871 by the "Dietetic Reformer" (monthly). The vegetarian creed has attracted very few disciples in England; and by these the advocacy of it has usually been conjoined with that of temperance, peace, homœopathy, and the cold-water cure.

There is, first, a physiological argument used in behalf of vegetarianism. It is

said that the formation of the teeth and of the intestines in man proves that man was not intended to be a carnivorous, but a fruit and vegetable eating animal. Then it is maintained that a vegetable diet is the most favorable to man, in all respects, physical, intellectual, and moral; that with it, his life is longer, his enjoyment of life greater, his brain more vigorous, and his power of manual labor not less than with an animal diet; and that, while the use of animal food begets ferocious dispositions, a carelessness about life, a callousness to the sufferings of men or animals, a vegetable diet "develops the gentler affections, and produces a broad and genial sense of brotherhood." It is affirmed that animal food produces febrile and inflammatory tendencies; that, like alcohol, it is a stimulant (some vegetarians call it a stimulating poison); and that a mixed diet is open to all the objections which lie against moderate drinking. It is also alleged that animal food as exposed for sale is often tainted with some disease or unwholesome condition, and that it thus becomes a frequent cause of disease in man. Moreover, it is submitted that vegetables contain all the principles necessary for the sustenance of man; that, therefore, the use of flesh is unnecessary; and that this being so, it is selfish, cruel, and tyrannical—calculated, too, to increase selfishness, cruelty, and tyranny in men—to cut short the existence of inferior animals.

The opinion of physiologists is not favorable to vegetarianism. The structure of man's organs is held to prove that nature intended him for an omnivorous animal, his stomach and intestines being fitted for deriving nourishment from every kind of food, and he being able, by means of cooking, to modify his food so as to prepare it for mastication and digestion. There is also almost a concurrence of medical experience against vegetarianism, and in favor of the opinion that man, as regards all his powers and faculties, thrives best, and that—if a difference can be made out—he also lives longest upon a mixed diet. It has been found, in making railways, that differences between workmen in respect of bodily strength and energy were chiefly due to a difference of diet; that, for example, a beef-eating Englishman would almost do the work of three vegetable-fed Frenchmen, and that this difference of working-power disappeared when the Frenchmen took to eating beef. Upon the alleged beneficent moral influence of vegetable food, it may be observed that there is no proof whatever of its reality; moreover, that since the majority of mankind live either mostly or entirely upon vegetables, vegetables must bear a large share of the responsibility which may fall upon diet for the evil tendencies of man; and that, in fact, the most cruel and the most debased of human races live entirely upon vegetables. To the charge of cruelty brought against the practice of killing animals for food, it has been answered, that the plan of nature contemplates such cruelty—if cruelty it be—and make it impossible to avoid it; that the microscope has shewn us that even in taking a draught of water we may deprive a multitude of beings of life; and that, on the other hand, the system of rearing cattle for the butcher—since the cattle would otherwise not be reared at all—really adds very largely to the sum of happy animal existence. It is not disputed that there is a liability to disease from the use of unwholesome meat; but, then, vegetables as well as animals are subject to diseases; and the reasoning which would drive us from the use of animal food because it may be diseased, would really cut us off from food altogether.

VEHMGERICHTE. See **FEMGERICHTE.**

VEII, an ancient city of Etruria, in early times the formidable rival of Rome. Its very site is disputed, but is now generally thought to be at *Isola Farnese*, about 12 miles from Rome. The struggle between the two cities is recorded by Roman historians to have commenced as early as the time of Romulus, and to have continued under each of the kings, except the pacific Numa, and always to the advantage of the Romans. The Volatines had their revenge so far under Porsenna; but after his time, being convinced by repeated defeats that they were no match for their enemy in the open field, they had recourse to the plan of sheltering themselves behind their walls on the approach of the Roman legions, and of sallying out on predatory expeditions as soon as they had retired. To relieve the republic from this annoyance, the Fabian clan, to the number of 806, with their followers, probably ten times as numerous, undertook to garrison a fortress near Veii, and act as a guard against the marauders. They were, however, enticed into an ambuscade, and cut off to a man at the Cremera. For the next 60 years, hostilities often broke out, fol-

lowed by ill-observed traces. At last, the Romans determined to rid themselves of their rival by a siege, and persevered with great tenacity, though the city held out for ten years, and repeated attempts were made by neighboring states to relieve it. It is said to have been taken at last by a mine, which was directed so as to lead into the citadel. The citizens were massacred or sold as slaves, and the land confiscated. The fall of Veil took place 396 B.C. It was debated more than once, especially after the destruction of Rome by the Gauls, whether Rome should not be abandoned, and Veil made the capital. After its fall, it was gradually deserted; and although, in later times, a colony was planted there by Cæsar, and again by Augustus, it always remained an insignificant place. There are remains of the Etrurian, and also of the Roman city, which have latterly been traced out and described.

VEIL. This familiar article of dress is one of the most ancient in use; its origin is lost in remoteness, but we find an allusion to the wearing of veils by the Chinese in Ovid, and Juvenal speaks of women as being so delicate as to be overheated by a silken veil. Although generally considered portions of female dress, we read in the works of Ambrose (374 A.D.), of "silken garments and veils interwoven with gold, with which the body of the rich man is encompassed." Its use is now so extended that it may be found in every part of the civilised world, but almost exclusively confined to women.

VEINS, in Anatomy, if we except the pulmonary, the portal, and the umbilical veins, are the vessels which carry back venous blood from the capillaries, and enlarging as they proceed, finally pour it through the ascending and descending *vena cava* into the right auricle of the heart. See **CIRCULATION.** Their coats are similar to those of the arteries, but much thinner, and even transparent. They are, however, of considerable strength. The *internal coat* consists of an epithelial layer, supported on several laminae of longitudinal elastic fibres. The *middle or contractile coat* consists of numerous alternating layers of muscular and elastic fibres; the muscular fibres being disposed circularly round the vessel. The muscular fibres are wanting in some parts of the venous system, and especially developed in others (as, for example, the splenic and portal veins, where, perhaps from the physical character of the tissues which they pervade, there may be more than the ordinary resistance to the passage of the blood). In the *vena cava* and pulmonary veins near the heart, striped muscular fibres may be detected, continuous with those in the auricles. The *external or areolar fibrous coat* consists of connective or areolar tissue, and of longitudinal elastic fibres; within some of the larger veins, as the inferior *vena cava*, through its whole length, the external iliacs, the azygos, &c., there is also a longitudinal network of unstriped muscular fibres. The existence of valves in the veins is mentioned in the article **CIRCULATION.** These valves are most numerous in the veins of the extremities, especially the lower ones, these vessels having to act against the force of gravity more than most others. They are absent in the *vena cava*, the hepatic, portal, renal, pulmonary, and some other large veins, and in very small veins generally. The veins are nourished by nutrient vessels or *vasa vasorum*, like the arteries; but except in a few instances (including the inferior *vena cava*), nerves are not distributed to them.

The chief diseases of the venous system have been already sufficiently described in the articles **PHLEBITIS, OR INFLAMMATION OF THE VEINS; PHLEBOLITES; PLEGMASIA ALBA DOLENS, OR MILE-LEG; THROMBUS; and VARICOSE VEINS.** We shall here merely refer to two conditions of the venous system which must be regarded as the results of natural rather than morbid action: they are *Hypertrophy* and *Atrophy*. Hypertrophy is a natural and healthy change, which will be readily understood by one or two illustrations. When the uterus enlarges during pregnancy, the quantity of blood in it increases in at least a corresponding ratio, and so also do the venous canals by which it is removed; while, shortly after delivery, they return to their natural size; the hypertrophy being accompanied with a proportionate dilatation. This form of hypertrophy, with dilatation, often exerts a compensative action, one vein, or set of veins, taking additional work (and consequently requiring an increase of calibre), to make up for the partial or entire occlusion of another. When, for example, the ascending *vena cava* is diminished in size, or even entirely and permanently closed, it is well known that the lower portion of the vessel dilates in common with the branches entering into it,

and that the superficial abdominal veins or *azygos*, or both, become enlarged, and thus carry to the heart the blood which ought to have reached the heart by the usual course. If the obstruction is only temporary, the enlarged veins return to their original state, except that additional transverse fibres are found in the middle coat. Atrophy of the veins accompanies the corresponding changes of other tissues, when a part is permanently diseased. Amputation above the knee soon reduces the femoral vein to less than one-third of its previous size. Mr. Callender, in his article on "Diseases of the Veins," in Holmes's "System of Surgery," states that in the case in which a kidney became transformed into a large cyst, the canal of the renal vein was impervious to a common probe; and this condition is daily seen in the change which occurs in the umbilical vein shortly after birth.

VEINS, in Geology, are crevices, more or less vertical, caused by the contraction during drying or metamorphoses, or by the mechanical disturbance of a rock, which have been filled by materials different from the body of the rock. Veins containing substances that have been injected in a state of fusion from heat, have had their origin in some internal force; while those filled with mineral deposits may or may not be connected with upheaval. Granitic and trappean veins differ from dykes chiefly in the greater size of the latter. They produce similar changes in the rocks which they penetrate, indurating clays and sandstones, and converting limestones into marble, or giving them a compact texture like hornstone. Granite veins are generally more sinuous in their course than those of trap. One set of veins often intersects another, having been produced at a later period; and the two sets generally differ in color, grain, and even mineral composition. Granite generally assumes a finer grain, and is even different in composition in the veins it sends into the adjoining rocks. Mineral veins are filled with different kinds of crystalline minerals. Quartz and calcite are the most common of these substances; but frequently several different minerals occur in the same vein, some of these being metallic ores. Veins of the same age are filled with the same metals, and generally maintain a general parallelism of direction. Thus, the tin and copper veins of Cornwall run nearly east and west; while the lead veins run north and south. Three kinds of veins are distinguished by the miners—*Rake*, *Pipe*, and *Flat* veins. The *rake* veins are simple crevices, crossing all the rocks of a series, generally highly inclined, and apparently formed from the contraction of the rock. The two originally opposite surfaces may retain their relative positions, only separated by the interposed contents of the veins; or a fault may place the originally contiguous surfaces at different levels; and in such a case, the intervening space between the walls of the vein are irregular, sometimes narrowing so that the walls are in contact, and then widening out, and forming large cavities containing ores. The *pipe* veins are irregular cavities, filled with minerals, and without any apparent connection with faults in the strata. *Flat* veins have a general direction corresponding with that of the stratification, and are connected sometimes with *rake* veins, and sometimes with *pipe* veins. The manner of working the minerals contained in veins is explained in the article **Mining** (q. v.).

VEIT, Philipp, a distinguished German painter, was born at Berlin, February 18, 1798. His mother, a daughter of Moses Mendelssohn, had for her second husband, Friedrich Schlegel, and V. became devotedly attached to the religious and artistic ideas of his stepfather, whom he followed in his renunciation of Protestantism for Roman Catholicism. After finishing his studies at Dresden, he proceeded to Rome in 1815, and became a prominent member of that coterie of young German painters who sought to infuse into modern art the purity and earnestness of medieval times. Of all the associates, V. ventured furthest into the obscure realms of symbolism and allegory. His first famous work was the "Seven Years of Plenty," executed as a companion-piece to Overbeck's "Seven Years of Dearth," and forming part of a series of frescoes illustrative of the history of Joseph, painted at the Villa Bartholdy in Rome. In richness and freshness of invention, it is reckoned one of the best works of the school to which it belongs. Other pictures of a high order of merit, done during his residence at Rome, are "The Triumph of Religion," (Vatican Gallery), "Scenes from Dante's *Paradiso*" (Massimi Villa), and an altar-piece, representing "Mary as Queen of Heaven" in the Trinità de' Monti. These procured him so great a reputation that he was called to the Directorship of the Städelische

Art Institute, in Frankfurt-on-the-Maine. While holding this position, he produced many grand pictures, of which the most celebrated is the large fresco (at the Institute), representing "Christianity bringing the Fine Arts to Germany," held by many to be the finest fresco by any modern artist. Others are, "The Two Maries at the Sepulchre," and "St George." In 1843, he resigned his post as director, and removed to Sachsenhausen, in Hesse-Cassel. Among his later works are, "The Ascension of the Virgin," "The Good Samaritan," "The Egyptian Darkness," and "Glorification of the Christian Faith in its Alliance with the Reigning House of Prussia," for the king of Prussia. In 1863, he painted several frescoes for Mayence Cathedral. He died December 1877.

VELASQUEZ, Diego Rodríguez de Silva, one of the most famous of Spanish painters, was born at Seville, in June 1599, of a family of Portuguese origin. Very early, the bent of nature became obvious in him; and he was sent to be educated in the studio of Francisco Herrera el Viejo, an artist of considerable force and originality. He afterwards became the pupil of Francisco Pacheco, a man accomplished in theory, but who could practically teach him little. The old pedant had, however, an attractive daughter, named Juana, who, doubtless, to the eyes of the young painter, atoned for her parent's deficiencies, and who married him at the end of five years. His chief education, however, as with all men of real genius, was that which he gave himself; he painted assiduously from the life; the models he selected were, for the most part, of the sordid pleasant class, and in this way a certain habit of mind was induced, unfavorable to the attainment of that pure and elevated ideal, some infusion of which is all that is wanted to elevate the noble realistic hardihood of his manner into the very highest region of the art. In 1622, he paid a visit to Madrid, to study the treasures of art there accumulated. During his stay, he painted the portrait of the poet Gongora, and made some influential friends, at whose instance he was, the year after, invited to return by the Conde Duque de Olivarez, the favorite of Philip IV. His portrait of this magnate so delighted the king, that he himself sat to the artist, and the result was a picture of superb merit, by the public exhibition of which the artist at once became famous. The office of court painter was bestowed upon him, and he found himself at once embarked on a full tide of the prosperity which continued through life to flow upon him. Of Philip IV. and his family he painted many pictures; and shortly after his appointment, he executed a portrait—unfortunately lost—of our own Charles I., then (1633) at Madrid on his famous fool's errand. The year 1628 was made memorable to him by the arrival, in Madrid, of the great Rubens, on a diplomatic mission. The two artists were worthy to become friends, and speedily became so; but though Rubens, during his stay, was assiduous in the practice of his art, the familiarity of V. with his florid harmonies of color and riot of animal vigor, seems to have exercised no modifying influence on the restrained gravity and severity of his own style, now thoroughly matured.

V. had long desired to visit Italy; and in 1629, permission was granted him to proceed thither. Everywhere he was received with the highest honors; and in Rome, in particular, Pope Urban VIII. assigned him apartments in the Vatican. Here he chiefly employed himself in copying the frescoes of Raphael and Michael Angelo; and it is remarkable that, in the one or two original pictures which he at this time produced, no hint of an influence can be traced from his studies of these mighty masters. He was not the less profoundly sensible of their power; though he has left it on express record, that, of all the Italians he considered Titian the greatest. Such, however, was his powerful individuality, that, his own style once formed, no such external influence was able to affect it appreciably. Having recovered from a severe illness, he proceeded to Naples; and finally, in the spring of 1631, returned to Madrid, where he was cordially welcomed by his royal patron, with whom he now became more and more a favorite. He had a painting-room in the palace assigned him; and the king was wont to come familiarly to watch him at work. It is a noble trait in the man, which deserves to be recorded along with his triumphs as an artist, that when, in 1643, the Duque de Olivarez, to whom he had been indebted whilst yet obscure, incurred disgrace at the hands of Philip, he braved the royal displeasure, by continuing to shew him in everything the respect to which he had been accustomed. In 1643, V. proceeded again to Italy, on a mission

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from the king to buy pictures and other works of art. He returned to Madrid in 1651; after which time many of his finest works were painted. Such was the favor in which he continued to be held by Philip, that, in 1656, the Cross of Santiago was conferred on him, an honor never before awarded except to the highest of the nobility; and shortly after, he was appointed Aposentador Mayor. This post, the duties of which consisted in attendance on the king in his journeys, and superintendence of everything essential to his convenience, was one of much honor and emolument; but it involved at times great trouble and anxiety; and on the specially important occasion of the conferences held, in 1660, to arrange the marriage between Louis XIV. and the Infanta, these were such as to utterly prostrate the painter. On July 31 of that year, he returned to Madrid, worn down with the overwork to which he had been forced to subject himself, and died in a week after, on the 7th August. He was buried with much ceremonial in the church of San Juan. His wife, who was passionately attached to him, only survived his loss about a fortnight.

V.—with the doubtful exception of Murillo—takes admitted rank as the greatest of Spanish painters. His portraits are, for force, penetration, directness, and severity of truth, of almost unrivalled merit; his historical pictures are also of rare value; his landscape effects are full of air and light; and his treatment of religious subjects only fails in defect of that deeper spirituality, the expression of which has been in its fineness attained by none save a few of the earlier Italians. The works of V. are in this country rare. The two or three specimens to be found in our National Gallery very inadequately represent his genius, of the power and variety of which a worthy conception is only to be formed at Madrid, where his finest works are preserved.

VELEZ-MALAGA, a town in the south of Spain, in the modern province of Malaga, and 16 miles east of the city of that name. It stands at the foot of a hill which forms part of the south range of the Sierra Tejeda, and rises with its fortress and its spires overlooking the river Velez, at a distance of less than two miles from the shore of the Mediterranean. The climate, said by the Andalusians to be "that of heaven," is delightful; and owing to the abundance of moisture supplied by the hill-streams from the north, and the heat of an almost tropical sun, the vegetation of the vicinity is of the most luxuriant description. The aloe, palm, sugar-cane, prickly pear, orange, vine, olive, indigo, and sweet potato (*Batata de Malaga*), grow here abundantly. There are here the ruins of a Moorish castle, with a small tower. The town was taken from the Moors by Ferdinand the Catholic, after a long siege. Pop. 15,000.

VELIKI-LOUKI, a town of Great Russia, in the government of Pskov, on the river Lovat, 130 miles north-west of Smoiensk. It is one of the most ancient towns of Russia, having belonged to Novgorod before the annexation of that territory to Moscow. Boots are largely manufactured, and exported to St Petersburg. Pop. (1867) 5069.

VELIKI-USTIUG, or Ustiug-Velik, a trading-town of Great Russia, in the government of Vologda, at the confluence of the Jug and the Suchona, 850 m. s.-e. of Archangel. It was founded in the 13th c. by a colony from Novgorod. Among the branches of industry are the manufacture of small iron-ware and of linen. Pop. (1867) 7722.

VELINO, Cataract of. See **TERNI**.

VELLE'IA, or Veleia, a town of ancient Liguria, situated among the northern slopes of the Apennines, 18 miles south-by-east of Placentia (Piacenza). Little information respecting it can be gleaned from the Latin writers. The Veleiatae are mentioned by Pliny among the Ligurian tribes, and seem to have been subjected to Rome in 158 B.C. The town, however, dates from the time of Tiberius, and appears, according to the traditionary account, to have been overwhelmed by a landslide of the mountains Moria and Rovinazzo, the earth having been loosened by the percolation through it of the waters from a lake high up in the mountains. A comparison of the soil which covers the city with that of the mountains, confirms this story, though, strange to say, there is not the slightest notice in Roman history of such an event having happened. V. remained hid and forgotten till 1747, when a

field-laborer turned up a tablet of bronze, on which Trajan's alimentary law for the public maintenance of 279 children was written. This tablet, which measured about 8 feet 8 inches by 5 feet 9 inches, Paris measurement, and weighed 7200 ounces, narrowly escaped being melted down for bell-metal; and in 1760, excavations were commenced by the directions of the Duke of Parma at the place where the tablet had been found. The result of these investigations, which were continued till 1765, was the discovery of a forum, in which was another bronze tablet of a smaller size than the one previously found, an amphitheatre, baths, 12 marble statues, numerous small bronze statues, medallions, coins, stamps, inscriptions, and bronze instruments of various kinds. From none of the coins discovered being of later date than the time of Probus, it has been supposed that the catastrophe which overwhelmed the city happened either during or soon after his reign. The museum at Parma contains most of the antiquities which have thus been rescued from the bowels of the earth.

For about a century previous to 1747, it was known to a very few that ancient treasures were concealed at the place where the town was subsequently discovered; and so much wealth in coins and gold statues was discovered by a poor priest belonging to the adjoining village of Macinisso, that his family became ennobled.

A few trifling excavations have been made since 1765, but they have now been discontinued for a number of years.—See "La Rovina di Veleia, misurate e disegnate da Giovanni Antolini," &c. (Milano, 1819); and "Tavola Legislativa della Gallia Cisalpina ritrovata in Veleia, da D. Pietro di Lama" (Parma, 1820).

VELLETRI, a city of Southern Italy, in the province of Rome, is walled, well built, and situated on a hill, 21 miles south-east of Rome. The principal buildings are the cathedral, an ancient Gothic structure; and the Ginetti Palace, with a marble staircase, esteemed the finest in Italy. The hill of Velletri, which, like the surface of all the country between it and Rome, exhibits evidences of volcanic action, produces good wines. Pop. 14,800.

VELLO'RE, a town and fort of British India, presidency of Madras, in the district of Arcot, 79 miles west of Madras, on the right bank of the Palar. The fort is extensive, is surrounded by a ditch cut in the solid rock, and contains barracks, hospitals, &c. The town is large, clean, and airy, and has an extensive and well-supplied bazaar. The town contains a most remarkable and splendid pagoda, dedicated to Kriehna, whose adventures with the *gopis*, or milkmaids, are represented in a series of elaborate sculptures. Although the heat of V. is great, it is considered one of the healthiest stations in the Carnatic. V. was the residence of Tippoo Saib's family from 1799 to 1806, when they were removed on account of a sepoy mutiny, which resulted in a terrible massacre of Europeans. Pop. 38,022.

VELLO'ZIA, a genus of plants of the natural order *Hæmodoraceæ*, natives of Brazil, Southern Guiana, and the Mascarene Islands. They are sometimes called *Tree Lilies*. They are perennials, with trunks closely covered by the withered remains of leaves, branching by forks, and bearing tufts of long, narrow, aloe-like leaves at the extremities of the branches. Some of them are from two to ten feet high, and the trunk is sometimes as thick as a man's body. The structure of the trunk is very remarkable. It has a slender sub-cylindrical central column, of the ordinary monocotyledonous structure, outside of which are arranged great quantities of slender fibrous roots, which cohere firmly by their own cellular surface, and form a spurious kind of wood. In some of the southern districts of Brazil, vellozias are found covering large tracts. The flowers of the larger species are about six inches long, either pure white, or of a beautiful purple color, much resembling the white lily of our gardens.

VELLUM. See **PARCHMENT**.

VELO'CITY (Lat. *velox*, swift) is the common term employed to denote speed, or *rate of motion*. It is obviously greater the greater the space passed over in a given time. But for its accurate measurement, we must distinguish between uniform and varying velocity.

Nothing is easier than the measurement of uniform velocity. It is measured by the space passed over in a unit of time. Thus, we speak of velocities of 10 feet per

second, 30 miles per hour, &c. But for scientific purposes, it is best to keep, as far as possible, to definite units of time and space; and those most generally convenient are the *second* and the *foot*. The latter is defined, from the imperial yard, by act of parliament; the former is usually chosen as the interval between the beats of a good mean-time clock. Unfortunately, its duration is not invariable; but, as ages must elapse before any sensible alteration takes place in its length, it may be used without inconvenience. If, then, v be the velocity of a point moving uniformly, we mean that v feet are passed over in each second; so that, if s represent the space passed over in t seconds, we have

$$s = vt,$$

a formula which contains the whole properties of uniform motion. It gives

$$v = \frac{s}{t};$$

that is, to find the velocity of a moving point (when uniform), divide the space (in feet) described in *any* period of time by the number of seconds in the period. This will give the same result whether we take a million seconds or the millionth part of a second, as the period in question. This at once shews us how to proceed in measuring a variable velocity, such as that of a stone let fall, in which case the velocity constantly increases, or of a stone thrown upwards, in which case the velocity constantly diminishes.

That a moving body has, at every instant, however irregular its motion may be, a definite velocity, is obvious, and is, in fact, matter of every-day remark. Thus, when travelling in a railway train, we say, shortly after starting: "We are now going at the rate of a mile an hour;" not thereby meaning that it will take us an hour to complete the mile, but that, *if we were to go on for an hour with the velocity we now have, we should run a mile*. Again, we may say: "Now we are going at 30 miles an hour;" not thereby meaning that we have so much as 30 miles to travel, or that our journey is to last more than perhaps a few minutes, but that *an hour at the present rate would take us 30 miles*. In common language, then, our question is, how to measure our present rate.

If we could at any instant so adjust the steam-power to the resistance of the air and the friction of the rails as to keep the rate unaltered, we should have uniform velocity, measurable with ease, as above shewn. But, as we cannot generally do this (though Atwood's machine enables us to do it in the case of a falling body), we are driven to some other expedient. Now, it is obvious that the smaller the interval we take, the less will our velocity have changed during its lapse, i. e., the more nearly will it have become uniform and measurable by the simple formula given above. That is, for a variable velocity we have

$$v = \frac{s}{t}$$

as an approximation, which is more and more nearly true as t , and therefore s is smaller. In the language of the differential calculus—whose fundamental notions, as laid down by its great inventor, were, in fact, derived from this very question, the velocity being simply the *Fluxion* (q. v.) of the space described—we have

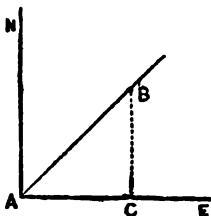
$$v = \frac{ds}{dt}.$$

Practically, by means of the electric chronoscope, we can now measure (very exactly) extremely small intervals of time, such, for instance, as the interval between the fall of the dog-head and the exit of the bullet from a rifle-barrel; so that a variable velocity now presents no formidable difficulty, as we can study and measure it *while it is almost absolutely uniform*.

We define *average* velocity as the space described in any time divided by the

number of seconds employed. This may not, except at one or more instants during the motion, represent the actual velocity; but it is a velocity with which, if uniform, the same space would have been described in the same time. We shall presently have an opportunity of usefully applying this definition to one interesting case of varying velocity.

The *resolution* and *composition* of simultaneous velocities follows, almost intuitively, from the most elementary geometrical notions. When a man is walking north-east at a uniform rate, it is obvious to common-sense that he is progressing north-



wards, and also eastwards. What is his northward, and what his eastward velocity? The answer is very simple. Suppose that in one second he walks from A to B, then AB represents his whole velocity. But draw AN northwards, and AE eastwards; also draw BC parallel to AN. Then AC is the space by which B is eastward of A, BC the space by which it is northward. Hence AC represents the eastward, and CB the northward velocity (each being the space in its respective direction described in one second), and these are called *components* of the velocity AB. AB, again, is said to be *resolved* into AC and CB.

The general proposition is this, that a velocity represented by one side of a triangle may be resolved into two, represented in magnitude and direction by the other sides of the triangle. One or both of these may be again resolved by a similar process; and we find, as the most general propositions on the subject, that velocities represented by all the sides of a polygon (whether in one plane or not) but one, taken in the same order round, are jointly equivalent to a velocity represented by that one side, taken in the *opposite* order; also that a point which has, simultaneously, velocities represented by the successive sides of any polygon, taken all in the same order round, is *at rest*. The second law of motion (see MOTION, LAWS OF) enables us to interpret this geometrical theorem into the Physical Truths known as the Triangle and Polygon of Forces in Statics.

Rate of change of velocity is called *Acceleration*. It is measured in the same way as velocity itself. Thus, if the change takes place in the direction of motion, it affects merely the amount, not the direction, of the velocity; and an acceleration α adds (or subtracts, if it be negative) α feet per second from the velocity affected. Thus it is found that gravity produces an acceleration of about 32.2 on all falling bodies; so that if a stone be let fall, its velocity after t seconds is 32.2 t . If it be thrown down with a velocity v , its velocity in t seconds is $v + 32.2t$. If thrown upwards with the same velocity, in t seconds its velocity becomes $v - 32.2t$, so that

it will stop and begin to descend after $\frac{v}{32.2}$ seconds have elapsed.

The space passed over by the stone in t seconds is easily calculated by the help of the *average* velocity. For, since in any of the above cases the velocity increases (or diminishes) *uniformly*, its average value during any interval is the average of its values at the beginning and end of the interval. Hence, for the stone simply let fall:

Initial velocity = 0,

Velocity after t seconds = 32.2 t ,

Average velocity during the first t seconds = 16.1 t . Hence, space described in t seconds

$$= t \times \text{average velocity} = 16.1t^2.$$

So that the spaces described are as the *squares* of the times.

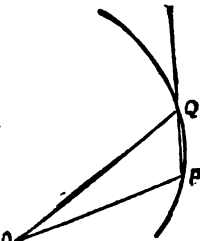
But, if the acceleration be not in the direction of motion, the direction and magnitude of the velocity will generally change. To exhibit this geometrically, Sir W. Rowan Hamilton (q. v.) invented the following beautiful construction of what he called the *Hodograph* of the motion. Let O be any fixed point, and from it

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draw lines OP, OQ, &c., representing, at every instant, in direction and magnitude the velocity of the moving point. The extremities of such lines will form a curve, such as PQ in the figure. If OP and OQ be any two of these, the *change* of velocity is represented (as above) by the third side, PQ, of the triangle. As Q is taken nearer and nearer to P, PQ becomes more and more nearly the tangent to the hodograph, so that the tangent at P has the *direction* of the acceleration, and the rate at which P moves round the hodograph is the *magnitude* of the acceleration.

If we consider any uniform motion, we see that the hodograph is a circle (its radius being the magnitude of the velocity), and from this it is easy to see that *in uniform motion the acceleration is always perpendicular to the direction of motion*. If we consider uniform motion, with velocity V , in a circle of radius R , the hodograph at once shews



that the acceleration is $\frac{V^2}{R}$, and is directed towards the centre of the circle.

Translated into Physics, acceleration (multiplied by the mass of the moving body) is the measure of the force which acts on the body. So the above simple example shews that, to keep a mass moving uniformly in a circle, it must be drawn towards the centre by a force proportional directly to the square of the velocity, and inversely to the radius. This is the physical explanation of the so-called Centrifugal Force (see CENTRAL FORCES).

VELOCITY, Initial, in Gunnery, is the speed with which the ball leaves the muzzle of the gun. This was formerly calculated from the momentum as shewn by the Ballistic Pendulum (q. v.). A great improvement of the last ten years is the Electro-ballistic Pendulum, the invention of a Major Navez of the Belgian service, which actually measures the interval of time during which the shot traverses a short space of ground. The apparatus consists of a steel pendulum falling at the side of a graduated sector of a circle. Behind the segment is a piece of iron capable of being magnetised by a galvanic battery adjoining. The wires for completing the circuit between the battery and the magnet are so arranged that they are in connection with two targets of paper or other thin material in the line of the projectile's fire. So long as the circuit is complete, and before the experiment, the magnet holds the pendulum at its highest point. When the shot pierces the first target, the circuit is broken, the iron demagnetised, and the pendulum released; these effects being absolutely simultaneous. With equal simultaneity, the piercing the second target re-establishes the circuit, magnetises the iron, and arrests the pendulum in its descent. The distance between the targets is known, and the accumulating resistance of the atmosphere within that time; the sector being finely graduated, the distance traversed by the pendulum shews exactly the fraction of a second occupied, and from these data the initial velocity is a matter of simple computation. Of an ordinary smooth-bore cannon, the initial velocity is about 1600 feet per second.

VELOCITY, Virtual. See WORK.

VELVET, a fabric in which, besides the ordinary warp and weft, which are usually arranged as in twill-weaving, there is also a supplementary weft, consisting of short pieces of silk, cotton, or woollen thread doubled under the regular weft, and brought to the surface in loops which are so close together as to conceal the regular web. The loops are afterwards cut evenly, and the ends thus made constitute a covering resembling a very short fur. In silk velvets, the warp and pile threads are both of organzine silk, which is the strongest used in weaving.

VE'NDACE (*Coregonus Willughbi* or *marcenula*: see COREGONUS), a fish of the family *Salmonidae*, found in the rivers and lakes of Sweden, in the Castle Loch at Lochmaben in Scotland, and in some of the English lakes. It is popularly said to have been introduced at Lochmaben by Queen Mary; but the statement rests on no authority, and is highly improbable, as the fish could not be easily transported, except by the roe, living only for a very short time after being taken out of the water.

Like most of its congeners, it is highly esteemed for the table. Its food consists chiefly of *Entomostraca*, and it is never taken by angling. Sweep-nets are used for its capture. It generally swims in considerable shoals, often with a remarkable separation of the sexes. It attains a length of 6 or 7 inches, is deeper in proportion than many of the Salmonidae, and of a compressed form. The outline rises quickly from the snout to the dorsal fin, and the body tapers rather suddenly at the tail. The under-jaw projects a little. The scales are of moderate size, and do not come off very readily. The tail is broadly forked. The back is brown, the sides tinged with yellow, the cheeks partly white, and there is a curious, red, heart-shaped mark between the eyes. It spawns in November and December, and multiplies rapidly, notwithstanding the presence of predaceous fishes in the waters which it inhabits. V.-fishing at Locknaben takes place only on the 1st of August each year. The V. might probably be introduced with advantage into many of the British lakes. It is doubtful if this fish is the same with the *Coregonus albus*, found in Pomerania.

VENDEE, La, a maritime dep. in the west of France, bounded on the w. by the Bay of Biscay, on the n. by the dep. of Loire-Inférieure, and on the e. by that of Charente-Inférieure. Area, 2587 sq. m.; pop. (1872) 401,446. The dep., which owes its name to a small affluent of the Charente, is traversed from east to west by a range of hills, called in the east the Plateau de Gâtin, and in the west the Collines Nantaises; and is watered in the north by the affluents of the Loire, and in the south by the Lay and the affluents of the Charente. The territory of La V. is divided into three parts, the names of which indicate the character of their configuration. In the west is the *Marais*, occupied by salt marshes and lakes; in the north is the *Bocage*, covered with plantations; in the south and middle is the *Plaine*, an open and fertile tract. The coast-line, 93 miles in length, presents few deep indentations, the chief being the Bay of Aiguillon, which affords secure anchorage for vessels. The climate is warm, humid, and unhealthy in the *Marais*, cold and humid in the *Bocage*, and warm, dry, and healthy in the *Plaine*. Cereals, potatoes, and vegetables are largely cultivated; the wine produced, which is white and of inferior quality, amounts to 8,500,000 gallons a year. Among the mineral treasures, iron ore is very abundant. There are three arrondissements—La Roche-sur-Yon, Fontenay-le-Comte, and Sables-d'Olonne. The capital is La Roche-sur-Yon.—For the wars of La V. (by which name the armed opposition to the religious and political changes in France is denoted, and which burst out into a species of partisan warfare in 1793, 1794—1795, 1799, and 1815), see CATHELIN, LAROCHEJACQUELIN, HOCHÉ, CROUVANS, &c.

VENDEMIARE (i. e., the "Wine-month") embraced, in the calendar of the first French Republic, the period from the 23d September to the 21st October. Particularly memorable in the history of the Revolution is the 18th Vendémiaire of the year IV. (5th October 1795), when the Paris "Sections," worked upon by royalist reactionaries in all sorts of ways, rose against the National Convention, but were decisively beaten by a military force under the command of Barras, or rather of his lieutenant, Napoleon Bonaparte, then a young officer only beginning to be known. The victory of the Convention saved the Republic—for a time.

VENDETTA (vengeance), the term used to denote the practice, as it prevails in Corsica, of individuals taking private vengeance upon those who have shed the blood of their relations. In Corsica, when a murder has been committed, the murderer is pursued not only by the officers of justice whose duty it is to punish offences against society, but also by the relatives of the slain, upon whom the received views of social duty impose the obligation of personally revenging his death. In such a case, the relatives of the murdered man take up their arms, and hasten to pursue, and if they can find him, to slay, the murderer. If he succeed in eluding their pursuit, the murder may be revenged upon his relatives; and as the vengeance may be taken whenever an opportunity occurs, the relatives of a murderer whose crime is unavenged have to live in a state of incessant precaution. When they go to the fields, they take their arms with them, and set a watch; at home, they have their doors well fastened, and their windows barricaded; and since the avenger is never far distant, they live, in fact, in a state of siege. Instances are on record of persons who were, as the phrase is, "suffering the vendetta," having lived shut up in their houses for 10 or 15 years, and being, after all, shot on the first occasion on which they ventured out of doors. Formerly, when blood had been shed, there

was a custom of proclaiming the war of revenge, and announcing to what degree of relationship it should extend; but this custom has gone out of use. Frequently, in the practice of this system of vengeance, each of two sets of relatives has a murder to revenge upon the other; the vendetta, that is, crosses. This is called the *vendetta transversale*. The duty of taking vengeance lies primarily and especially upon the next of kin. Not to take revenge, is deemed in the highest degree dishonorable; and any delay in doing so on the part of the next of kin is made matter of reproach by his relatives. When the Genoese were masters of the island, their laws declared the *rimbioco*—the uttering of such reproaches—punishable, as an incitement to murder. But there is seldom occasion for the *rimbioco*, for the Corsican is brought up to regard the vendetta as the most sacred duty of man. The women instigate the men to revenge by singing songs of vengeance over the body of the slain, and displaying his blood-stained garments. Often a mother affixes to her son's dress a bloody shred from the dead man's shirt, that he may have a constant reminder of the duty of taking vengeance. Although the vendetta usually has its origin in bloodshed, smaller injuries may give rise to it, and even purely casual occurrences. Mediators, termed *parolanti*, often interpose to make up a quarrel. When they succeed, an oath of reconciliation is taken, and this oath is regarded as specially binding. It is infamous to break it; nevertheless, it is broken now and then. Brigandage prevails to a great extent in Corsica, and the origin of the career of a brigand, in almost every instance, can be traced to the vendetta. A man commits a murder out of vengeance; he flees to the hills; it never is safe for him to resume his former life again, and so he turns robber for a living. Besides the vendetta, properly so called, hereditary family feuds are very common in Corsica; and sometimes there are hereditary feuds between whole villages. The great families of the island hand down feuds from generation to generation, in which not only themselves and all their relatives, but all their servants and dependants are involved—the kind of feud which was common in the Italian towns of the middle ages, and which is illustrated in the play of "Romeo and Juliet."

The origin of the vendetta has often been referred to the lawlessness which prevailed in many parts of Corsica during the period of the Genoese domination, and to the venality which vitiated the Genoese administration of justice. And, no doubt, the insecurity and the mal-administration of justice which existed in Corsica for ages, helped to consolidate this barbarous custom; which, thus consolidated, has been perpetuated by the isolated position of the country, and the absence of civilizing influences. But the explanation of its origin must be sought in more general causes, for it is not exclusively a Corsican custom. On the contrary, it may be safely affirmed that a system of private vengeance, almost precisely similar, has existed amongst every people during certain stages of its progress—never entirely passing away until government became strong enough to insure redress of injuries, and to restrain the passions of individuals.

In the case of rude tribes, in the savage or semi-savage state, there is on record such a multitude of instances of the existence of the blood-feud, that its universality among men in that state cannot be doubted. Its incidents are usually the same which Sir G. Grey found subsisting among the aborigines of Australia, and of which, in his "Journals of Travel in the North-west of Australia," he has given a vivid description. The Australian tribe usually includes several stocks or bodies of men, between whom blood-relationship is acknowledged; and every member of a stock is bound to assist in taking vengeance for a personal injury done to any of his kinsmen. On the other hand, though a hunt is always made for the actual wrong-doer, the injury may be satisfactorily avenged upon any member of his stock. As in the Australian and similar tribes, there is no relationship acknowledged between members of the same family unless they are also members of the same stock (see article *TRIBE*), the blood-feud occasionally arrays father against son, and brother against brother. It often leads to the break-up of a tribe.

Of the prevalence of the blood-feud among tribes which have advanced to what is called the patriarchal state also, there is very ample evidence. Among such tribes, the cohesion of the family is very powerful; everything relating to the family is quasi-sacred; and the duty of taking vengeance for kindred blood is not merely a

matter of honor, but of religion. Volney's description of the blood-feud, as practised among the Bedouins, will do for all the tribes of this class; and it might almost stand for a description of the vendetta. "The interest of the common safety," he says, "has for ages established a law among them (the Bedouins) which decrees that the blood of every man who is slain must be avenged by that of his murderer. This vengeance is called *Tar*, or retaliation; and the right of exacting it devolves upon the nearest of kin to the deceased. So nice are the Arabs upon this point of honor, that if any one neglects to seek his retaliation, he is disgraced for ever. He therefore watches every opportunity of revenge; if his enemy perishes from any other cause, still he is not satisfied. His vengeance is directed against the nearest relation. These animosities are transmitted as an inheritance from father to children, and never cease but by the extinction of one of the families, unless they agree to sacrifice the criminal, or purchase the blood for a stated price in money or in flocks. Without this satisfaction, there is neither peace, nor truce, nor alliance between them, nor sometimes even between whole tribes." The blood-feud is observed, almost precisely as described above, among the Circassians, the Druses, and the numerous hordes of Central Asia; it seems to have had the same incidents, too, among similar tribes in ancient times—e.g., among the Greeks of the Homeric period, among the Germans in the time of Tacitus, among the northern nations who overran Europe after the fall of the Roman Empire. The Corsican vendetta seems to be the same thing as the Bedouin *Tar*, surviving, with slight modifications, in a secluded island, where the law has never made itself supreme, long ages after the progress of society and the consolidation of government have effaced every trace of it, except at a few isolated points on the neighboring continent of Europe. The vendetta exists in Sicily and in Sardinia, as well as in Corsica; in Calabria also; and it (or we should rather say, the blood-feud) flourishes vigorously among the Montenegrins and the Albanians.

The right of private war which subsisted in Europe in the middle ages—introduced by the northern nations who shared the spoils of the Roman Empire—was just a modification of the blood-feud. This right belonged only to the nobility, and could be exercised only against men of equal rank. It was usually resorted to on account of insults publicly done, of atrocious acts of violence or bloodshed, and similar injuries. The right of vengeance devolved first upon the next of kin; but all the kindred within the degrees of relationship to which the ecclesiastical prohibitions of marriage extended, were bound to take up the quarrel; and this obligation was so far sanctioned by law, that if any one failed to fulfil it, he was deemed to have renounced his kindredship, and to have lost his rights of succession. Vassals, equally with kinsmen, became implicated in the vengeance of their lords; and every person present when the cause of quarrel arose was required to take side with one or other of the parties. For several centuries, private wars were constantly being waged within the kingdoms of the continent, and the efforts of kings and ecclesiastics to restrain them produced little effect until governments became strong enough to prohibit them, and to enforce the prohibition.

It is now apparent that the vendetta represents a system which prevailed everywhere before the consolidation of society into the state, and the establishment of a police capable of protecting life and property. This system was a rude substitute for government and the administration of justice. The family, or the body of kindred, formed, in fact, a commonwealth of itself; its members held firmly together; and when one was injured, all the little state was injured. The Nagas have no government, and among them the blood-feud is the only check—it is not altogether inefficient—upon the selfishness and the passions of individuals. As society became consolidated, the exercise of this right of vengeance was curtailed—remaining longest with the nobility, who counted it as one of their most valuable privileges, and maintained it as long as possible. They had to surrender it at last, because the state grew strong enough to supersede the action of individuals in redressing injuries, and was able to do this with greater fairness, and without the same admixture of calamitous results.

VENDÔME, House of. V. was an old county of France, erected into a duchy by Francis I. for behoof of Charles of Bourbon, the grandfather of Henry IV. On the accession of the Bourbons to the throne, it was reunited to the crown, but again separated from it by Henry IV., who conferred it upon Cesar, the eldest of his sons

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by Gabrielle d'Estrées. Cesar's eldest son, Louis, Duke of Vendôme, married Laura Mancini,* one of Mazarin's nieces, and had by her three sons, the eldest of whom was Louis-Joseph, DUKE OF VENDÔME, the celebrated French general who so distinguished himself during the war of the Spanish Succession. He was born at Paris, July 1, 1654, and made his first appearance on the field of battle as a lifeguardsmen during the Dutch campaign of 1672, afterwards serving with distinction under Turenne in Germany and Alsace, and under Cregul in Flanders. Released by the peace of Nimègue (1678), he retired to his château of Anet, near Dreux, where he resigned himself to the most liberal indulgence in all kinds of pleasure. At this time, he became compromised in the affair of Lavoisin (see POISONING); but it turned out that his intercourse with the pretended seer was prompted merely by curiosity. On the outbreak of war in 1688, he was ordered to the Low Countries, where, under Luxembourg (q. v.), he earned deserved renown at the sieges of Mons and Namur, and the battles of Leuse and Steeukerk; and his high reputation was not diminished by his subsequent conduct in Italy, where he commanded the left wing of Catinat's army at the battle of Marsaglia (October 4, 1693). But V.'s brilliant gallantry and military talents had not hitherto succeeded in obtaining for him the honor of an independent command, for it was only too evident that with these valuable qualities were combined inveterate indolence, and careless and disorderly habits, which might, as effectually as the most utter incapacity, ruin the chances of any enterprise under his management. However, the necessities of the case induced Louis ultimately to give him (1695) the command of the army in Catalonia; and he was agreeably surprised at the alertness of V., who closed a series of brilliant successes by the capture of Barcelona, an exploit which did much to bring about the peace of Ryswick (1697). After five years of inaction, spent in sloth and sensuality, he was despatched by his sovereign to supersede Villeroy in Italy. His arrival was hailed enthusiastically by the soldiery, who relied implicitly upon his brilliant genius and happy audacity to extricate them from all difficulties, and with whom his excessive laxity in the matter of discipline rendered him a great favorite. The restored confidence of the troops was proved by the victories of Ustiano and San-Vittoria; while the enforced retirement of Prince Eugene beyond the Minio equally shewed the superior strategic abilities of their general; and it required the utmost exercise of both to prevent the surprise at Luzzara (August 15, 1702), brought about through V.'s usual carelessness, from becoming a total rout. From this time, a slight though temporary improvement in V.'s habits is visible; in 1703, he drove the Austrians before him into the Tyrol, repeatedly defeating Starhemberg; when the defection of the Duke of Savoy forced him to retreat. The duke, though joined by Starhemberg, was beaten again and again, and at last cooped up in Turin, whither Eugene was advancing to his relief, when the defeat of his advanced guard by V. compelled a halt. The imprudent Frenchman, however, intrusted the difficult duty of holding Eugene in check to his younger brother, the grand-prior, who, though a gallant soldier, was no match for his opponent in generalship; and had not V. returned to Cassano just in time to divide the honors of the battlefield with his opponent, the army of observation would have been scattered to the four winds of heaven. Again, partially stimulated by this narrow escape, V. displayed unwonted vigor, and drove the Austrians into the Trentin; but in the summer of 1706, he was recalled to supersede Villeroy, who had blundered in the Low Countries, as he had formerly done in Italy. Unfortunately, V.'s besetting faults were attempted to be remedied by uniting the Duke of Burgundy with him in command; and the want of a thorough understanding between the conjoint chiefs led to the defeat of the French at Oudenarde (q. v.), and to the failure of the attempt to relieve Lille. The cause of these reverses formed the subject of vehement discussions in France, and though undoubtedly V. was mostly to blame, his great reputation gained him the public support; yet Louis XIV. held him in a sort of disgrace for a time. In 1710, a cry of distress arose from Spain, where the British and Austrians were

* It is curious to remark the relationship between the opposing leaders in the great war of 1700-1713. Vendôme (French) and Prince Eugene (Allied) were cousins; Vendôme was second cousin to the Duke of Burgundy; Eugene was similarly related to the Duke of Savoy; and Marlborough (Allied) and Berwick (French) were uncle and nephew.

carrying all before them; and in compliance with the urgent request of Philip V. (who had served under V. in Italy) to his grandfather to send him—not a reinforcement, but only V., the heroic old debauchee was once more roused up from his lair, and despatched to Spain. His appearance, like that of Du Guesclin more than three centuries before, brought together as if by magic a numerous army of volunteers; towns, villages, and even religious establishments united in a most enthusiastic manner to contribute the necessary funds, and Philip was settled in his capital before the close of the year. A week after, Stanhope and the British troops were defeated and captured at Brihuega; and on the following day, Starhemberg and the Austrians were completely routed at Villa Viciosa. The grateful monarch raised his deliverer to the rank of a prince of the blood-royal, and presented him with 500,000 livres (£20,000), a gift which V. accepted only to distribute it among his soldiers. V. for the last time relapsed into his usual habits, and after "a month of extraordinary gluttony," died of indigestion at Vinaroz in Valencia, June 15, 1712. V., of all the descendants of Henry IV. both then and since, bears the strongest resemblance to his great-grandfather; but of the resolute persistency and self-denial of the first and greatest of the Bourbon monarchs, we cannot discern in him the slightest trace.—Saint-Simon's biography of V., and Voltaire's "*Siècle de Louis XIV.*," are the principal authorities for the life of this extraordinary man.

V.'s disinterestedness, like his other good qualities, and they were not a few, became a vice from its very extravagance. It is related that one of his domestics demanded permission to leave his service on the ground that he could not stand by to see a master robbed by his servants in such a barefaced way. "Is that the reason?" said V.; "very well, then, rob like the others."

VENDÔME, a town of France, in the dep. of Loir-et-Cher, seated on vine-clad hills, on the Loir, which here divides itself into many canals, 45 miles west-south-west of Orleans. It contains cavalry barracks; a theatre; the church of the Trinity, a remarkable edifice; one of the most beautiful colleges of France; and the ruins of a lofty castle. Manufactures of cloths, needles, and embroideries are carried on with activity. Pop. 6588.

V., a very ancient town, and said to have been of importance under the Merovingians, was the capital of the ancient county of Vendomois, which was erected into a duchy-peerage by Francis I., in favor of Charles de Bourbon. Henry IV. conferred it on one of his natural sons, who thus became the founder of the House of V. In 1870, it was the scene of several conflicts between the French and Germans.

VENEER (Fr. *fournir*, to furnish), a layer of wood, cut very thin, for the purpose of being glued on to the surface of a commoner kind. Only choice kinds of hard woods are sawn into veneers, and they are usually attached to deal or pine, so as to give all the appearance of being made solid. In this way, the more costly kinds of furniture-woods are economically used by the cabinetmaker, for with the improvements which have been effected in the process of sawing, veneers as thin as paper have been produced.

VENEREAL DISEASE. See SYPHILIS.

VENERIDÆ, a family of lamellibranchiate molluscs, having a regular, closed, bivalve shell; the teeth and laminae of the hinge near together in a single group under the beak (*umbo*); generally three diverging teeth in each valve; a marked oval impression in front of the beak; the general form similar to that of the cockles (*Cardiacæ*), but usually more flattened. The mantle has a large opening in front; the siphons are unequal, more or less united; the foot is tongue-shaped, compressed, sometimes grooved, and producing a Byssus (q. v.). The species, all of which belong to the Linnean genus *Venus*, are very numerous. They are very widely distributed, but abound chiefly in tropical seas. About forty are found on the British coasts, some of them very common. The V. are generally elegant in form, and often finely colored. Some of them have the shell furnished with long spines, but chevron-shaped lines are their common ornament. The V. first appear in the oolitic rocks, and are more abundant in the present than in any former geological epoch.

VENESECTIO (occasionally termed PHLEBOTOMY, and popularly known as BLOOD-LETTING or BLEEDING) is an incision into a vein, for the abstraction of blood. Although the operation may be performed on many of the superficial veins, it is restricted in this country to the veins at the bend of the elbow. Of these veins, the most prominent are the median-cephalic and the median-basilic; the former be-

ing situated on the outer side of the tendon of the biceps muscle, while the latter lies on the inner side, and only separated from the brachial artery by a thin layer of fascia. Hence, from fear of wounding the artery, the median-cephalic should be preferred; but in reality the median-basilic is usually selected, in consequence of its being the more prominent and larger vein of the two. The appliances required are a lancet, a bleeding-tape or narrow bandage, lint, a bowl to receive the blood, a basin of water, and a sponge. The patient being placed in a sitting position, the tape or bandage must be tied sufficiently tight around the middle of the upper arm, or rather lower, to arrest the venous circulation without materially affecting the pulse at the wrist. The forearm having been allowed to hang down till the veins are tense, the operator must make his selection, and taking the blade of the lancet between the forefinger and thumb of the right hand, should fix the vein by pressing his left thumb upon it just below the part he is about to open. Steadying his hand by resting the ends of the three outer fingers on the forearm, he should steadily (and without a jerk or plunge) introduce the point of the lancet obliquely until the interior of the vessel is reached, and the blood is seen rising up. Without penetrating deeper, he should thrust the instrument forward, so as to open the vein longitudinally to a sufficient extent. On now removing the thumb, the blood should emerge in a full jet; and if the stream be scanty, the patient may have a hard body—as a piece of stick or a pick-st-knife—placed in his hand, with directions to grasp it firmly, or the surgeon may increase the flow by chafing the palmar surface of the forearm, rubbing from below upwards. When a sufficient quantity of blood has been abstracted, the thumb of the left hand should be placed on the wound, and the ligament loosened; a small pad of lint should then be placed over the orifice, the surrounding parts should be cleaned of blood by a sponge, and the pad of lint compressed against the arm by the tape or narrow bandage, applied in the figure-of-eight form, with the crossing of the tape lying on the pad. After the operation, the arm should be carried in a sling for a day or two. We have, contrary to our ordinary custom, given the details of the operation, because it is one which, if performed at the proper moment, may be the means of preserving life, and which any person of ordinary intelligence could probably perform more safely, after reading these directions, than the farriers, barbers, &c. who are frequently called upon to perform it in remote country districts and in the backwoods of our colonies. Amongst the occasional ill consequences of venesection may be mentioned: (1) The escape of blood into the surrounding cellular (or connective) tissue, giving rise to a swelling called a *Thrombus*, which, if it does not rapidly become absorbed, should be emptied by the lancet. This is due to a want of coincidence between the wound in the integument and in the coats of the vein. (2) Phlebitis, which generally arises from the use of an unclean lancet. (3) Varicose aneurism and (4) Aneurismal varix, both of which may be included under the term Arterio-venous Aneurism, since in each case there is an aneurismal dilatation of an artery communicating with a vein; while they differ in this respect, that varicose aneurism is said to exist when an artery has been punctured through a vein (in this case, the brachial artery through the median-basilic vein), and a false or traumatic aneurism, composed of lymph that was effused between the vessels, has formed between them, and opens into both; while aneurismal varix is similarly produced, but the two vessels adhere together, the communication between them remaining permanent. These diseases often have such a tendency to remain stationary, that no interference is necessary; occasionally, however, very serious surgical treatment is required, for details of which we may refer to that excellent article on "Aneurism," in Holmes's "System of Surgery."

In children, and occasionally in others, where the veins of the arm are small and undefined, blood is drawn from the external jugular veins. As this operation would only be performed by a surgeon, it is unnecessary to describe it; and we will merely remark, that as the entrance of air into the vein during the operation, or until the orifice of the vein has been closed, would cause instant death,* this vein should only be opened in extreme cases.

* Few deaths are more rapid than those caused by the entrance of air into the veins of the neck. Many surgical operations in that region have proved fatal from this cause; and the knowledge of this fact has been applied to the slaughtering of horses, oxen, &c. It is probably one of the most humane forms of destroying life.

We have no space to notice at any length the general results of bleeding, or the much disputed question, whether venesection should not be discarded from our list of operations,† because no rational doubt can be entertained that, although, until a quarter of a century ago, or later, there was a most unnecessary and probably hurtful effusion of blood, venesection, in properly selected cases, is one of the most valuable remedies. A patient can bear a much greater loss of blood in the horizontal position than when sitting, and in that position than when standing. The condition required to be produced is that there should be incipient faintness; and the loss required to produce this effect varies extremely in different individuals and in different diseases. The late Dr Marshall Hall, in his work "On the Effects of the Loss of Blood," states that the average loss of blood required to produce slight faintness in a healthy person in the sitting position is 15 ounces. In some diseases, more, and in others less, than this loss can be borne. The greatest loss can be borne in congestion of the head, or tendency to apoplexy (from 50 to 40 ounces); then in inflammation of the serous membranes and of the parenchymatous substance of various organs (from 40 to 80 ounces); then acute anasarca (about 20 ounces); and then inflammation of the mucous membranes (about 16 ounces); while the system bears less than the quantity borne in health, in the eruptive and other fevers, in delirium tremens, dyspepsia, and chlorosis—a set of diseases in which blood-letting is now scarcely ever resorted to.

VENETIAN CHALK, a variety of soap-stone or steatite, used sometimes in the manufacture of drawing crayons.

VENETIAN STYLE of Architecture. This term is applied to the particular phase of the Renaissance developed in Venice. Under the head **ITALIAN ARCHITECTURE**, the peculiarities of the various schools of Italian architecture are pointed out. The Venetian is the most picturesque and ornate, as compared with the styles of Rome and Florence. "Venetian-Gothic" indicates the peculiar phase of that style so common in Venice and the north of Italy, and chiefly applied to domestic architecture. See **GOthic ARCHITECTURE**.

VENEZUELA, a republic in the north-west of South America, bounded on the n. by the Caribbean Sea, on the w. by the United States of Colombia (New Granada), on the s. by Brazil, and on the e. by British Guiana. Lat. 1° 20'—12° 25' n.; long. 59° 45'—73° 17' w. Within recent years, the country has been variously subdivided. In 1854, there were 15 provinces—those of Apure, Barcelona, Varinas, Barquisimeto, Carabobo, Caracas, Coro, Cumaná, Guiana, Maracaybo, Margarita, Mérida, and Trujillo—with an aggregate population of 945,408. Subsequently, the number of provinces was increased to 21, by subdividing 8 of the original provinces. In 1863, after the Federals had conquered the Unionists, a confederation was formed, and the number of *states* was reduced to 7. The present distribution is into 20 states, a federal district, and 3 territories. The area of the country is estimated to embrace 401,700 square miles; and the population in 1873 was 1,784,194. The capital is Caracas, or more correctly, Caracas (q. v.). The coast-line, extending from east to west—from the delta of the Orinoco to the boundary of the United States of Colombia—is 1584 miles in length. The most easterly part of the coast-line, 150 miles in length, and formed mostly by the delta, is washed by the Atlantic, and is very low. The waters of the Gulf of Paria beat upon bold and rocky shores. The remainder of the coast-line, including the north shore of the peninsula of Paria, is washed by the Caribbean Sea, and the coast, for the most part low and marshy, is sometimes precipitous, the mountains rising like a wall from the water's edge. With trifling exceptions, the country is abundantly watered. Its great river is the Orinoco, which drains by far the greater part of it, and the course of which is almost wholly within its boundaries. The other greater rivers of V. are affluents of the Orinoco (q. v.). Numerous streams, small in comparison with the great rivers, flow north into the Caribbean Sea and the Lake of Maracaybo (q. v.), which is by far the largest lake in

† On this subject, the non-professional reader may consult a long foot-note to Dr (now Sir Thomas) Watson's "Lectures on the Principles and Practice of Physic," 4th ed., vol. i. pp. 231—234; and Dr Markham's "Lectures on the Change of Type in Disease; with a Letter by Sir Thomas Watson," 1866.

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the country. The Andes enter V. from the west, and divide into two branches, the first of which runs north toward the coast, under the names of the Sierra de Perija and the Montes de Oca, but rise no higher than 4200 feet; while the other branch running in a north-east direction, terminates near the coast, in long. $68^{\circ} 30'$ w., and attains a much greater elevation. That part of the north-east branch of the Andes called the Sierra Nevada de Merida, and situated about 100 miles south of Lake Maracaybo, contains the only mountain that rises above the line of perpetual snow, and the two peaks of which are 15,343 and 15,810 feet high respectively, the loftiest in the country. South and south-east of the Orinoco, are the most mountainous districts of Venezuela. They form a vast, confused, and mostly unexplored region, but none of these mountains rise to the height of the main peaks of the Andes. The country embraces vast table-lands, known under the names of *Llanos*, *Paramos*, *Mesas*, and *Punos*. There are extensive, low, marshy tracts along the coasts and the lake and river banks, which, however, are abundantly fertile during the dry season. For the most part, the soil of the country is fertile. In the mountainous district in the south-east, there are great tracts well suited for the production of grain. Of this region, the lands not more than 2000 feet above sea-level are called *tierras calidas*, or hot lands; those between 2000 and 7000 feet are called *tierras templadas*, temperate lands; and those above 7000 feet are the *tierras frias*, cold lands, in which the average temperature is 49° F., and which are mostly uninhabited. The warmest tracts are the palm-lands; and the sago-palm, cocoa-palm, and others, grow here to a most colossal size, and yield most valuable products. Among the forest trees are the mahogany, satin-wood, rose-wood, black and white ebony, and caoutchouc; and there are forests of the cinchona or Peruvian bark tree. The cocoa and coffee trees, sugar-cane, indigo, and cotton plants are cultivated. Vegetables in great variety are raised, and tobacco is a profitable crop. Among the wild animals are the puma, ounce, and wild-cat; the jaguar is now becoming rare. The alligator, crocodile, boa-constrictor, and rattlesnake are found. Of domestic animals, great herds of cattle and wild-horses roam over the *llanos*, and mules, asses, sheep, goats, and pigs are reared. The inhabitants are made up of whites of Spanish extraction; Indians, who are docile and industrious, and are the miners, agriculturists, and manufacturers of the country; some negroes and mixed races. Agriculture is the great pursuit, though only about one-tenth of the whole area is under cultivation. Manufactures are few; commerce is important, and would be much more so, were there well-constructed roads and other means of conveyance than mules. The principal articles of export are coffee, cotton, cocoon, sugar, indigo, tobacco, salt, hides, live-stock, tallow, horns, sarsaparilla, dye-woods, and timber. The imports are manufactured goods, provisions, and wine. During the five years 1864—1870, the imports averaged £1,000,000; the exports, £1,200,000. In 1875 the value of the imports was £3,760,000; exports, £4,028,000. The religion of the mass of the people is Roman Catholic, though other forms are tolerated.

History.—The east coast of V. was discovered by Columbus in 1498; Ojeda and Vesputci followed in 1499, and, entering Lake Maracaybo, they found an Indian village constructed on piles, to prevent the evil effects of inundation, and they named the place Venezuela, or Little Venice, a name which afterwards spread to the whole country. The first settlement was made at Cumana in 1520, by the Spaniards; and V. remained subject to Spain till it claimed independence in 1811. It then returned to allegiance to Spain, but again revolted in 1813, and, forming with New Granada and Ecuador the republic of Colombia, was declared independent in 1819. In 1831, the states separated. See COLOMBIA. In 1865, Juan Falcon became president, but died in 1868, when the Unionists overcame the Federalists. In 1870, the Federalists regained their supremacy.

VENIAL SIN (Lat. *veniale*, pardonable, from *venia*, pardon), a term used, chiefly in Roman Catholic theology, to denote the less heinous class of offences against the law of God. Roman Catholic divines infer from many passages of Scripture that there are various grades of guilt in the culpable actions of man, and that these varieties of guilt involve a corresponding variation in the liability to punishment which is thereby entailed. Lowest in this scale of imputability is the class of offences known as venial, and by this name distinguished from those which are called mortal. Much difference of opinion exists even among Catholics themselves

as to the nature and origin of this distinction. Some ancient writers explained mortal sins as being offences against a *precept*, whereas venial sins are but violations of a *counsel*. This explanation, however, is now universally rejected; and it is held that sin, of its very essence, whether mortal or venial, supposes the violation of a *law* or precept. Another explanation of the difference declares mortal sin to be that which deprives the soul of sanctifying grace; whereas venial sin only weakens and diminishes, but does not utterly extinguish sanctifying grace in the soul. This is an explanation, however, rather of the effect than of the nature of venial sin; and the more received opinion is that of St Thomas Aquinas, who explains mortal sin to be that which of itself subverts the end of the law; whereas venial sin but diversifies it in a greater or less degree from that to which God intended that it should be directed. Catholics, while insisting on this distinction, are careful to explain that venial sin, although absolutely pardonable, is not to be supposed to be easily pardonable. They hold that it is of its own nature a great "deordination," and that it may and does entail a heavy liability to punishment, although not to the eternal punishment of hell, which is reserved for mortal sin. Sins may be venial either objectively or subjectively; objectively, when the "object" of the law, or what is technically called the "matter" of the sin, is light or trivial; as in the case of a petty theft, a slight departure from truth, or a passing ebullition of impatience or anger; subjectively, when, even though the "matter" or "object" is grave, there is but imperfect advertence, or not full consent, on the part of the subject or agent; as in the case even of a grievous injury done without full knowledge or intention on the part of the agent, or without full and deliberate consent. The degree of culpability in each case is supposed to depend on the objective or subjective qualification of the act. Catholics hold that persons dying in a state of venial sin are not excluded for ever from heaven; but that, since nothing unholy, even though in a minor degree, can approach God, the soul departing from life so stained with venial sin, is compelled to undergo a purification in Purgatory (q. v.), which they conceive to be of greater or lesser severity and duration according to the degree of culpability. Some of these writers teach that even venial sins involve punishment of extreme severity; and all expressly declare that it is never lawful, under any circumstances, to commit the smallest venial sin, even for the purpose of compassing a good and holy object.

Protestants reject the whole doctrine of *mortal* and *venial* sins. They regard all sins as, in one sense, *mortal*, i. e., as exposing the sinner to "the wrath and curse of God, both in this world and that which is to come;" but all sins of the believer are expiated by the blood of Christ, so that there remains no penalty to be paid, either by penances in this world, or by sufferings after death. The very notion of venial sins appears to them to make light of the law of God; whilst that of the expiation of venial sins by the sufferings of the sinner himself, is inconsistent with their doctrine of justification, and with their views of the efficacy of the sacrifice of Christ.

VENICE, a fortified city of Northern Italy, one of the noblest, most famous, and singular cities in the world, is built upon a crowded cluster of islets, in the lagoon of the same name, on the north-west fringe of the Adriatic Sea, 23 miles east of Padua by the Milan and Venice Railway; lat. 45° 25' n., long. 12° 30' e. The lagoon of V. is banked off from the Adriatic by a long, narrow sandbank, extending south-west from the mouth of the Piave to that of the Adige, and divided into a number of islands by narrow sea-passages, six in number. Formerly, the chief of these entrances into the lagoon was the *Porto di Lido*, through which all the great merchantmen of the republic passed direct into the city, and which is still frequented by small vessels, and by the Trieste steamers. The *Porto di Malamocco*, between the island of the same name on the south, and that of Lido on the north, is now the deepest channel into the lagoon. Inside of this sandbank, and between it and the mainland, which is from three to five miles distant, is the lagoon—a sheet of shallow water, navigable for vessels of very light draught, except where channels have been formed naturally by rivers, and artificially maintained. In some parts of this marshy, sea-covered plain, islets have—by the action of currents and otherwise—become consolidated into ground firm enough to be built upon, and fruitful enough to be cultivated; and in the midst of a crowded cluster of such islets, amounting in number to between 70 and 80, the

city of V. is built. In the vicinity of V., the ebbing tide (the difference between high and low water is only between 2 and 3 feet) lays bare nearly everywhere a great plain of calcareous mud, laced, however, by an intricate network of narrow channels, from which the sea never retires; while at high water the whole surface is covered by the sea to the depth of from 1 to 1½ feet. The chief of the islands upon which V. is built is called *Isola de Rialto* (i. e., *rivo alto*), or Island of the Deep Stream. The islands, in many places only shoals, afford no good foundations for buildings; and the city, for the most part, is built upon artificial foundations of piles or stone. The fact that this city of marble palaces seems to rise vision-like from the unsubstantial sea, is sufficient to render its aspect at all times more or less fascinating; but in summer and autumn, the seasons of the highest tides, when the Grand Place of St Mark's is partially flooded, and when the image of each palace is doubled by reflection in that "green pavement, which every breeze breaks into new fantasies of rich tessellation," the city is indeed marvellously beautiful. The Canalazzo, or Grand Canal—its tortuous course through the city being in the form of the letter S reversed, divides V. into two unequal parts, and is the main thoroughfare for traffic or pleasure. But the city is subdivided by 146 smaller canals, or *risi*, as they are termed. These are the water-streets of V., by means of which passengers can be conveyed to any quarter, for here the canal is the street, and the Gondola (q. v.) is the cab or carriage. Access can also be had to all parts of the town by land—across the canals by bridges, and amongst the houses by narrow lanes called *calli*. There are in all 806 public bridges, and of these, three cross the Grand Canal—the Rialto, a stone structure, and the most famous; and two iron bridges. The Piazza or Square of St Mark's is the great centre of business and amusement, and the locality most frequently visited by travellers in Venice. It is 576 feet in length, 269 feet in greatest width, and 185 feet in least width. The east side of this square is occupied by St Mark's Church. The first church of St Mark's was built in 813, but was destroyed by fire in 976. It was rebuilt in 1071, and consecrated before the close of the 11th century. The edifice is Byzantine, with Gothic additions of the 14th c., and Renaissance alterations of the 17th century. It became the cathedral and seat of the patriarch in 1807. The plan of St Mark's is the Greek cross. Above the doorway are the four famous horses which Marino Zeno brought from Constantinople in 1206, which were carried away by Napoleon in 1797 to Paris, and restored to V. in 1815. A great dome rises over the intersection of the lines of the cross; and over the transepts, other domes arise. The carved work, which is very profuse, is of the most exquisite description; and the building is perfect as an example of the delicately colored architecture of the East. The structure is of brick, incrustated with richly colored marbles. To the right of this beautiful edifice is the *Torre dell Orologio* (built in 1494), with a splendid dial in gold and azure, and very complex and ingenious movements. The north side of the square is almost entirely taken up by the *Procuratie Vecchie*, built in 1517, for the accommodation of the Procurators or trustees of San Marco, who had the care of the edifice, the management of its property, &c. Facing the Procuratie Vecchie, and on the south side of the square, are the buildings of the *Procuratie Nuove*, which are connected with a facade, which forms the west side of the square; and the two buildings constitute the *Palazzo Imperiale*. Leading south from the Piazza is the Piazzetta, or Little Square; and near the point where it makes an angle with the great square, is the Campanile, or Bell Tower, of St Mark, placed at some distance in front of the building to which it belongs. It was begun in 902, and completed in 1510, is 323 feet high, 42 feet wide at the base, and is surmounted by an angle, which serves as a weather-cock, and is said to be 30 feet high. On the west side of the Piazzetta are the old Library and the Mint, the former now forming a part of the Palazzo Imperiale. At the south of the Piazzetta are the two famous red granite columns of V., one of which is surmounted by a figure of St Theodore, the patron saint of the republic till St Mark supplanted him; the other covered by the lion of St Mark. On the east side of the Piazzetta stands the Palazzo Ducale or Doge's Palace. The first palace reared on the site of the present one was built in 812, and though frequently enlarged, rebuilt, and re-decorated, it retained throughout the character of a Byzantine structure. In the year 1301, its architectural character began to change; and from that time till 1423, all the rebuilding and enlarging were executed in Gothic. After the date 1423, there are no buildings in

Venetian architecture, properly so called; and the alterations made in the Ducal Palace after that time, as well as the palaces subsequently built, which took their style of architecture from the Doge's Palace, were in Renaissance and like almost all the architecture now to be seen in V., "of immeasurably inferior spirit in the workmanship" to that native style which flourished with the republic, and decayed with it. Starting from the landing-place of St Mark's at the east extremity of the Grand Canal, and proceeding west, a great number of palaces are passed. In former times, these palaces, or the magnificent buildings which occupied the same sites, were the warehouses and places of business of the great merchant-princes, most of whom possessed mansions in the suburbs, i. e., on some neighboring island, which afforded more privacy than could be found in the city itself. A few of these are worthy of mention. Among them are the *Palazzo Giustiniani*, now the *Albergo dell' Europa*, perhaps the best hotel in V.; the *Palazzo Contarini Fasani*, a beautiful specimen of the richest Venetian Gothic of the 14th c.; on the left bank, the *Palazzo Pisani a S. Polo*, in arabesque Gothic of the beginning of the 15th c.; further on, on the right, the *Palazzo Loredan*, the *Ca' d' Oro*, a building of the 15th c., in the oriental style, restored by Mademoiselle Taglioni, the celebrated dancer. The bridge of the Rialto crossing the Grand Canal consists of one arch, the span of which is 91 feet, and the height from the water 24½ feet. The width is 79 feet, and the bridge is divided into three streets—the middle one 21 feet wide—and two rows of shops. The Bridge of Sighs (*Ponte dei Sospiri*) stretches across the canal called the Rio Palazzo, and communicates between prisons on the east, and the Doge's palace on the west bank of the canal. It is a covered gallery; and prisoners, when led to execution, passed from their cells across this gallery to the palace, to hear sentence of death passed upon them, and then were conducted to the scene of death between the red columns. The churches of V. are, as a rule, fine edifices, and of various styles. The styles are chiefly, first, Venetian Gothic, massive and solemn; second, Lombard; third, classical, i. e., Italian; fourth, decorated Italian. Among the chief churches after St Mark's are those of the *Frari*, with a colossal monument of Titian, a number of excellent pictures, &c.; and the church of *S. Giacomo di Rialto*, at the foot of the bridges of the same name, occupies the site of the first church erected in V. in 481. But of the multitude of churches, a great many, though of pleasing proportions, are in the later and degraded styles of architecture. The Fine Art *Accademia* is located in the ancient convent of *La Carità*, was formed in 1807 by Napoleon, and consists of several schools, and has the finest collection of pictures of the Venetian school, including works by Titian, Tintoretto, Bonifacio, Giovanni Bellini, Paolo Veronese, and many other masters. Specimens of the works of these artists are also to be found in many of the palaces and churches of the city. There are several theatres, the chief of which is *la Fenice*. Fresh water, formerly, and even still to some extent, obtained at great expense, and of bad quality, from the mainland, or kept in cisterns, is now obtained by means of a number of Artesian wells, sunk in 1847, at the expense of the municipality. The library of St Mark's contains 120,000 vols., and 10,000 MSS. Many writers have led to misconception by omitting to note the fact, that the V. of to-day is by no means the same city as the V. of earlier and more famous days. On this subject, it will be of interest to quote the following from Ruskin's "Stones of Venice" (vol. ii. pp. 4, 5): "The Venice of modern fiction and drama is a thing of yesterday, a mere efflorescence of decay, a stage-dream, which the first ray of daylight must dissipate into dust. No prisoner whose name is worth remembering or whose sorrows deserved sympathy, ever crossed that 'Bridge of Sighs,' which is the centre of the Byronic Ideal of Venice; no great merchant of Venice ever saw that Rialto, under which the traveller now passes with breathless interest." Among the chief manufactures of V. are the glass-works, in which magnificent mirrors, artificial pearls, gems, colored beads, &c. are made, and which employ 4500 people. Jewellery, especially chains of the precious metals, gold and silver stuffs, silks, laces, velvets, soap, earthenware, wax-candles, &c. are also manufactured; and sugar-refining and ship-building are carried on. The trade of V. greatly declined for several years previous to 1866. This decline, however, being due to the uncertain and unsatisfactory political state of the Venetian provinces, there have been signs of revival since the incorporation of V. with Italy. In 1874, the value of the total imports amounted to £10,019,265; that of the exports to £7,-

902,597. The goods imported consist chiefly of cotton, coals, coffee, colonial produce, woollen and linen yarns, and manufactured goods; and the exports, of grain, fruits, fish, wine, &c. In the same year 8475 vessels (including coasters), of 578,741 tons, entered the port, of which 902, of 177,159 tons, were British. Pop. (1872) 128,901.

History.—Previously to the Roman conquest, we know almost nothing of the history of Venetia; but at the time when that event took place, we know that this region was inhabited by two nations, the Veneti and the Carni. The Veneti, from whom the district derived its name, occupied the tract between the Plavis (Piave) on the north, and the Athesis (Adige) on the south. The origin and affinities of this people are unknown, and almost the first thing ascertained concerning them is, that in the very earliest times of which we have any record, we find them a commercial rather than a warlike community, carrying on a trade in amber, which they brought from the shores of the Baltic, and sold to the merchants of Phœnicia and Greece. Under the Roman Empire, the province became opulent and flourishing; and besides its capital, Aquileia, which rose to be one of the most prosperous cities in Italy, it contained also the powerful and wealthy provincial cities, Patavium (Padua) and Verona, and numerous important towns. But before the close of the empire, the early prosperity of this province was swept away by the Huns under Attila, who, in 453, razed Aquileia to the ground, and devastated the cities of Concordia, Altinum, Patavium, Vicentia, Verona, and other cities of the province. Many of the inhabitants of these cities, driven from their ruined homes, sought shelter in the marshy lagoons, in a position too miserable to provoke the ambition of the conquerors, and defended from invasion from the mainland by the wide tract of muddy shallows which intervened between it and the actual shore, and secured against attack by sea by the shallowness of the water and the intricacy of the sea-passages. Of the cluster of islands upon which ancient V. stood, the principal were Grado Bibione, Caorlo, Heraclia, Equilo, Torcello, Murano, Rialto, Malamocco, Pelestrina, Brondolo, San Nicolo, Chioggia (Piccola and Grande), Amiano, Constanziaco, Olivolo, and Spinalunga. To Rialto and to Malamocco, the refugees from Padua resorted. The name of the province they had left was afterwards transferred to the cluster of the islands of the lagoon—the new settlement being commonly known, at least as early as the 8th c., as Venezia, or as we have it, Venice. Protected by the peculiar position of the islands in which they had found refuge, the early settlers devoted themselves to the pursuits for which their situation offered the greatest facilities—fishing, and the manufacture of salt. Houses began to cluster thickly on the Rialto; and when, in 568, Padua was sacked by the Lombards, many of its inhabitants emigrated to that infant colony which their ancestors had helped to found. The first form of government of the island-commonwealth was republican, administered by a consular triumvirate; but in 457, the consuls were superseded by tribunes, who, elected annually, and varying in number at different times from one to twelve, administered the government for 240 years. But during this period, although the young republic progressed in wealth and population, it did little to increase its political importance. Society was divided into factions by the ambition of the rival tribunes, and variety of interests rendered united action in warfare impossible. With the purpose of remedying the many evils of the government, Cristoforo, Patriarch of Grado, in 697, laid before the Arengo—the periodical convention of the whole adult male population—a scheme in which he proposed that the tribunes should abdicate sovereign power, and that a magistrate, with the title of Duke or Doge, in whom should be vested undivided authority in civic, ecclesiastical, and military matters, should be placed over them. The proposition was received with much favor, and the election to the office fell upon Paolo Luca Anafesto, who was invested by the Metropolitan with his insignia of office, a crown of gold and a sceptre of ivory, March 697. Anafesto remained at the head of affairs till his death in 717, and under his rule the position of the republic greatly improved. Civil discords were in great measure stilled, and the Venetian territory was increased by the acquisition of a strip of the mainland, obtained by treaty from the king of the Lombards. Under Orso, the third Doge (790—787), the Venetians entered upon that career of enterprise in which their prudence and their valor were always equally conspicuous, and which they continued to pursue to the last. In 785, the Lombards seized Ravenna, compelling the Exarch (q. v.) to seek shelter in the la-

goon, and implore the republic to lend her aid in re-acquiring the lost territory. Still considering themselves as nominally subject to the eastern emperor, besides being anxious, in the interests of their commerce, of securing the alliance of Constantinople, and of obtaining the freedom of the seas of the Eastern Empire, the Venetians supplied the required assistance, and re-instated the Exarch in his vice-royalty. The services of the Doge on this occasion were rewarded by the Byzantine court with the honorary title of Hypatos, or Imperial Consul. The common punishment among the Venetians for tyranny was putting out the eyes, and the reigns of several of the doges at this time are but periods of tyranny and excess on the part of the ruler, terminated by excommunication or assassination by the people. By a treaty concluded in 803 between Charlemagne and the Emperor of the East, it was stipulated that the maritime towns of Istria and Dalmatia should be considered an integral portion of the Eastern Empire. This stipulation was adhered to till the year 808, when the aggressive policy of Charlemagne, and of his son Pepin, now king of Italy, prompted Nicephorus, the Emperor of the East, to despatch a squadron to the Adriatic, and to seek the alliance of the Venetians; and as the latter perceived that they had much more to gain from the friendship of the court of Constantinople—the key to the rich waters of the East—than from that of Charlemagne, the alliance was soon cemented. War immediately broke out; and V. was invaded by King Pepin, who took a number of the islands without meeting any resistance—the inhabitants having all been transferred to the central island, Rialto. The French advanced to the island of Albion, when, to their dismay, they found that the tide had been ebbing, and that their vessels were stranded in these shallows. The whole French squadron now fell an easy prey to the swift-moving galleys of the Venetians; and such of the enemy as escaped being drowned, were massacred by the relentless islanders (809). This struggle, called the battle of Albion, was conducted on the part of the republic by Angelo Badoer, tribune of the island of Rialto, who was raised to the rank of Doge, and transferred the seat of government to Rialto—the island of Heraclea and others having previously enjoyed that honor. In his reign also, connection was established between Rialto and all the circumjacent islands, by means of wooden bridges, and the cluster thus united now formally took the name Venezia (Venice), although it commonly received that name early in the previous century. The year 829 is memorable as that in which, according to tradition, the body of St Mark was transferred to V. from Alexandria. "That the Venetians possessed themselves of his body in the 9th c., there appears," says Ruskin, "no sufficient reason to doubt;" and however we may regard this story, it cannot be denied that the belief in it by the Venetians and others attracted crowds of pious pilgrims to Rialto, and thus increased the traffic and prestige of the port; while the Venetians adopted St Mark as their patron saint; and their war-cry, "Viva San Marco!" inspired their courage in many a fight, both on sea and land. For many years after this date, the history of V. is marked by no event of special note; but the naval importance, the commerce, and wealth, and refinement of the republic, increased year by year. Doge Orseolo II. (991–1008) greatly extended the trade of the republic by establishing commercial relations between it and the empires both of the East and West, the Crimea, Syria, Egypt, Tartary, Tunis, &c.; and under his rule, the territory of V., which, until lately, comprised only the islands of the lagoon, and a narrow slip of territory on the mainland, was increased by further acquisitions on the mainland, and by the addition of the sea-bords of Dalmatia and Istria, which he annexed in 993. In 1083, the provinces of Dalmatia and Croatia were formally ceded to V. by the Emperor of the East; and at the same time the emperor exempted the Venetian traders in all parts of the empire, excepting in Cyprus, Candia, and Megalopolis, from all duties and imposts whatever. In 1099, V. sent forth a fleet of 207 vessels of all sail to the succor of Godfrey de Bouillon and his companions of the First Crusade. The defeat of a hostile Pisan fleet employed by the eastern Emperor, Alexius Comnenus, and the capture of 20 of the vessels, and the obtaining of the body of St Nicholas at the island of Myra, were the chief incidents of this expedition, which partook more of the nature of a predatory cruise than of a pilgrimage and crusade. But it is noticeable that in all the cases in which V. joined the Crusaders, the chief motive seems rather to have been to monopolise the maritime department of all these movements, and to extend her commercial relations, than to secure the Holy Sepulchre in Christian possession.

The great fires of 1106, which, besides destroying the island city of Malamocco, reduced 80 churches and vast numbers of private dwellings in V. to ashes, were indirectly the cause of great improvements in the architecture of the city; for previously to this event, the dwellings of the Venetians were almost all built of wood; but after it, the material used was always either stone or marble obtained from Italy, Istria, or Dalmatia, in all of which it is found in abundance. In 1111, the Doge Faliero sent forth 100 galleys to aid Baldwin I., the successor of Godfrey de Bouillon, in the conquest of such Syrian ports as remained in the hands of the Mussulmans; and for the assistance thus rendered, the Venetians obtained the right to hold in possession a church, street, mill, bakery, bath, &c. and to be represented by a local magistrate in each of the oriental possessions of Christendom—rights of the very greatest importance to a trading community. In 1123, a fleet sent to succor the Christians in Palestine, and led by the Doge Michiel, distinguished itself by gaining a magnificent victory over an Egyptian fleet, and by the capture of ten Turkish galleons richly freighted. In the same year, the Venetians and their allies, the Christians in Palestine, reduced the almost impregnable city of Tyre, after a siege of four and a half months. In 1123, a decree was passed by Johannes Comnenus, the Eastern emperor, commanding the Venetian residents at Constantinople and the other Greek ports to quit the imperial dominions, and declaring the suspension of all intercourse between the two powers. The islanders thus saw the most profitable branch of their commerce threatened with extinction; and, resolved to make reprisals, they launched a fleet in 1123, and in that and the following year, they inflicted a terrible punishment on the empire, capturing Rhodes, and investing and sacking Andros, Samos, &c., all the Ionian islands, a portion of the Peloponnese, &c. Further, this brilliant expedition was not brought to a close until all the Dalmatian fleets, stirred to insurrection by Stephen, king of Hungary, were again reduced to submission. The Venetians were prominent members of the League of Lombardy against the German emperor; and in 1177, won a splendid victory over the Ghibellines, headed by Otto, son of Frederick Barbarossa, in defence of Pope Alexander III., who had appealed for protection to the republic. Otto's squadron numbered 75 sail, chiefly drawn from the ports of Genoa and Ancona; the Venetian force consisted of 84 large galleys; and the victory they gained influenced the pope to shew his gratitude by presenting the Doge Ziani with a ring, with which he commanded him to wed the Adriatic, that posterity might know that the sea was subject to V. "as a bride is to her husband;" and it is recorded that in this year the pompous ceremony of the "marriage" was celebrated for the first time. The result of the naval battle of Saboro was that Frederick agreed to a congress, which took place at Venice in 1177. On the occasion of this congress, when the pope, the Doge, and other dignitaries were assembled in the palace of St Mark's, Frederick, approaching the throne on which Alexander III. was sitting, and prostrating himself, allowed the pope to plant his foot upon his neck. The congress of V. restored peace between the empire and Lombardy and Sicily. The Doge Ziani died in 1178. He did much to improve the architecture of the city, especially of the Square of St Mark. Of the three lofty red granite pillars which he is believed to have brought from the island of Scio, two adorn the portico of St Mark's—the third fell overboard and was lost in the attempt to land it. In October 1202, the expedition known as the Fourth Crusade set out from V. in Venetian vessels, under the command of the venerable Doge, Arrigo Dandolo; it did not, however, reach Palestine, but directed its force against the Byzantine Empire, which fell into the hands of the so-called Crusaders, April 1204. See DANDOLO. On the division of the conquests of this expedition, V. received the Morea, the Illyric Isles, a large portion of Thessaly, the Sporades, the Cyclades, the cities of Adrianople, Trajanople, Dedynotichos, and Durazzo, the province of Servia, and the coasts of the Hellespont. A fourth part of Constantinople was set apart as a quarter where the Venetians might reside, under the protection of their own laws; and all restrictions as to trade were abolished. V. was now in possession of the fairest portions of the Lower Empire, and she had long been undisputed mistress of the seas. As she increased in power, she also increased in magnificence; and her nobles, having no lands in which they might employ their wealth, lavished immense sums upon their palaces, their pictures, decorations, and costly garments. Her palaces were decorated with the treasures and

spoils of the East, and a school of artists arose, who found noble subjects for their pencils in the deeds of Fallero, Polani, Ziani, and the Dandolo. Her noblemen were now the most opulent in Europe, and travel and refinement had made them also the most polished. The most notable events in the history of V. during the 13th c. are her wars with Genoa, in which her hitherto unfailing good fortune deserted her, and the star of Dandolo succumbed to that of Doria at the desperate battle of Cerzuela, from which conflict the Venetians could only retire with 19 out of 96 of their galleys, the others being taken or burned; the truce effected between V. and Palæologus, the Emperor of the East, in 1268; the electoral reforms by which, after a complex and often repeated process of election and reduction by lot, the forty-one members were chosen who formed the Electoral College, and of whom it was necessary that the Doge-elect should obtain at least the votes of twenty-five. In 1299, the inquisition was formally established in V., but this institution was rendered subject to so many limitations by the government of the republic, that it remained comparatively harmless. In 1310, a conspiracy was formed for the correction of abuses that had crept into the constitution, and for the punishment of actual and fancied crimes. Among the conspirators were members of many of the noblest families of Venice. This conspiracy, known as the Quirini-Tiepolo conspiracy, proved abortive; but among other reforms to which it gave rise was the formation of the famous Council of Ten, who caused themselves to be declared a permanent assembly in 1335. In 1343, Andrea Dandolo, born in the year of the Quirini-Tiepolo conspiracy, a most accomplished scholar and statesman, was raised to the Dogate. His "*Venetian Annals*," remarkable for their precision and accuracy, place their author in the first rank of mediæval historians. In 1348, the lagoon was visited by an earthquake, accompanied by unusually high and destructive tides. These misfortunes were followed in the same year by a most frightful visitation of plague; and in the course of the six or seven months during which the epidemic raged, two-fifths of the population of the city perished, and fifty patrician families became extinct. The middle of the 14th c. is remarkable for the famous conspiracy headed by the Doge Marino Fallero (see FALLERO), and for a war with Hungary, in which V. lost Dalmatia. The commercial rivalry of V. and Genoa in the east led to a war in 1352, in which the Venetians were defeated (February 13, 1352) by Paganino Doria in the straits of the Bosphorus; and though they recovered their lost laurels in a battle (August 29, 1353) off the Sardinian coast, their fleet was totally destroyed by Doria, in the Gulf of Sapleuca, November 3, 1354, and they were forced to make peace in the following May. In 1378, the Venetians interfered in the quarrel between the Genoese and Cypriots, and their fleet vanquished that of the Genoese before Antium (July). In revenge for which the Venetian fleet was almost annihilated off Pola (May 1379), and Pietro Doria, advancing upon V. itself, seized the island of Chioggia. But the courage of the Venetians was nothing weakened by their dreadful reverses, and they soon changed the aspect of affairs by becoming in turn the besiegers themselves, blockading the enemy in Chioggia, and, after reducing him to the brink of starvation, accepting an unconditional surrender, June 1380. In 1396, Genoa, the oldest and most harassing foe of the republic, ceased to have separate existence as an enemy, for in that year she placed herself under the dominion of the king of France, an arrangement which afforded immeasurable relief to V., because, for several reasons, there was now much less chance of a rupture between the two maritime powers. For a number of years after this event, V. experienced the highest prosperity: a prodigious impulse was given to her trade; her argosies traversed every arm of the ocean; intimate intercourse was kept up with every European country, as well as with Syria, Egypt, and even India; and important articles of Venetian merchandise were the iron of Staffordshire, the tin of Cornwall and Devon, and the wool of Sussex. But no less beneficent than the effects of peace were those of the war which soon broke out between Novello, Lord of Padua, and Venice. At the conclusion of this war (1407), V. found herself in the possession of an empire on the mainland of Italy, the smallest communal section of which equalled their ancient island domain, and of which the principal cities were Vicenza, Verona, Padua, Feltre, and Belluno. With the death of the Doge Mocenigo in 1423, a new era in the existence of V. commences, for now "the central epoch of her life was past, the decay had already begun." During the next thirty years, war was continually waged, chiefly against the Dukes of Milan, in

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the course of which V., taking into pay Carmagnola (q. v.) and his bands, achieved many a splendid victory, and suffered many a disastrous defeat; and though, on the return of peace (1455), the territory of the republic was materially increased, by the acquisition of Brescia, Bergamo, Treviso, &c. on the mainland, this territory was obtained only after a struggle, enormously expensive in life and treasure, and during the continuance of which the commerce of V.—the well-spring of its prosperity at all times—began to decline. Mocenigo's last advice to the senate was to avoid war, which was certain to bring destruction on the country, and to prosecute industriously their trade and commerce, and cultivate the arts of peace. The rejection of this advice, combined with the narrow-minded selfish policy always pursued by the Venetians in the contests among the Italian states, was the prominent cause of its decline. The same fatal warlike policy was pursued throughout the 15th c.; and the whole of the 16th c. was employed by them in repairing the disasters which the league of Cambrai had brought upon them. Her policy in the 17th c. was to aid the opponents of her most dangerous neighbor, Austria, by recognising Henry IV. of France, aiding Bethlem Gabor and Ragotski, the Duke of Savoy against Spain, and the Protestants against the Catholics of the Grisons. From 1646 to 1669, war was carried on between the Venetians and Turks, the latter being, in almost every encounter, severely defeated; though, from the disproportionate strength of the antagonists, they ultimately gained Candia, the object of the war. The discovery of the Cape of Good Hope by the Portuguese in 1486, opened up to that nation an ocean-route to India, which was taken advantage of by Vasco da Gama, who rounded the Cape on his voyage from Lisbon to Calicut in 1497. The carrying-trade of the world was now no longer, as it had been, in the hands of the Venetians; and the vast commercial activity which sprang up among the western nations of Europe upon the discovery of America, clearly shewed that the naval superiority of the republic had for ever disappeared. But even in spite of these changes of fortune, V. might still have maintained a respectable mediocrity among maritime states, but for the character of her government, which was conducted by an exclusive oligarchy, in whose hands alone all power and freedom were vested. Long prior to the invasion of the republic by Napoleon in 1796, V. had become worn out and corrupted; the government of the Council of Ten had become a reign of terror; its nobles shewed vigor only in the pursuit of pleasure; its peasants, inured to peace, were unequal to war—all the ancient virtue, valor, and hardihood, which had raised a colony of fishermen, "perched like sea-fowl" on a muddy shoal, to be a nation of the first rank, had died out of the state. Napoleon forced V. to break the neutrality which it meant to maintain in 1796, destroyed its government, and ceded the province to Austria by the treaty of Campo-Formio (q. v.). In 1806, the city of V., with the territory of Venetia, was annexed to the kingdom of Italy by the treaty of Presburg (q. v.); but it was transferred to Austria in 1814. In 1866, the city and territory were ceded to and incorporated with, the Kingdom of Italy.

VENETIA, TERRITORY OF, ceded to Austria in 1815 (see **VENICE, HISTORY OF**), formed from that year, along with Lombardy (q. v.), what was called the Lombardo-Venetian Kingdom, one of the Austrian crownlands. In 1859, Lombardy was ceded to Italy, but V. continued in the possession of the Austrians till 1866, when, as one of the results of the famous "Month's War," it also was ceded to Italy, and is now incorporated with that kingdom. While still in Austrian possession, V. was regarded as bounded on the n. by the Austrian crownlands of the Tyrol and Carinthia; on the e. by Görz and Gradisca; on the s. by the Adriatic Sea, the river Po, and the Duchy of Modena; and on the w. by the river Adige and the Tyrol. Area, 9024 sq. m.; pop. (1871) 2,641,000. The territory of V., ceded to Italy by the treaty of peace, October 8, 1866, has the same frontiers which it had as an Austrian province.

VE'NI CREA'TOR SPI'RITUS, an ancient and very celebrated hymn of the Roman Breviary, which occurs in the offices of the Feast of Pentecost, and which is used in many of the most solemn services of the Roman Catholic Church. Its author is not known with certainty. On the authority of an ancient life of Notker, it is ascribed to Charlemagne; and Daniel, in his "Thesaurus Hymnologicus," adopts this opinion; but it seems to be certainly older than the age of Charlemagne; and its correct classical metre, as well as the purity of its language, bespeak an earlier and purer age.

None makes it highly probable, by intrinsic evidence, that it is the composition of Pope Gregory I. The *Veni Creator Spiritus* must not be confounded with another hymn to the Holy Ghost, *Veni Sancte Spiritus*, which somewhat resembles it. The latter belongs not to the Breviary, but to the *Missal*, in which it forms a "Sequence" in the Mass of Pentecost Sunday and Octave. The latter hymn is not in classical metre, but in rhyme; and its language is plainly of a lower age. The author of the *Veni Sancte Spiritus* is believed to be King Robert of France, to whom several other hymns of the same class are attributed.

VENLO, a small but strongly fortified town in the Netherlands, province of Limburg, is situated on the right bank of the Maas, 45 miles north-north-east of Maastricht, and has a safe little haven. The fortifications are very irregular, consisting of a main wall, canal, outworks, three powder-magazines, &c. The town is well built, and stands on elevated ground, surrounded by morasses. Principal buildings are the town-house, the great arsenal, the church of St Martin, &c. V. has good schools and several charitable institutions. Pop. about 8000. The Roman Catholics number upwards of 7000; the remainder, except 100 Jews, being Protestants.

The principal means of living is trade with Germany in coal, stone, lime, iron, bricks, grain, &c.; besides stone-bewing, tanning leather, dyeing, grinding corn, beer-brewing, making cigars, starch, vinegar, chocolate, Venlo pepper-cake, &c.

V. was walled by Duke Reynold of Gelder in 1843. It has many a time felt the horrors of a siege, and been taken and retaken, the last time by the Belgians in 1830, in whose hands it remained till the Conference of London, June 22, 1839, when it returned to the Dutch.

VENN, Rev. Henry, a pious "evangelical" clergyman of the English Church, was born at Barnes in Surrey in 1725. Having studied and entered into holy orders—in this respect following the example of his paternal ancestors since the Reformation—he was shortly after appointed curate of Clapham. In 1759, he resigned his curacy, to become vicar of Huddersfield in Yorkshire, which he left in 1769, on being presented to the rectory of Yelling in Huntingdonshire. He died in the house of his son, John Venn, rector of Clapham, in June 1797. The memory of his pure life, good example, and earnest preaching was cherished for many years after his death in the places which had benefited by his ministration; and his name is associated with those of John Newton, Thomas Scott, Charles Simeon, and others, as having had considerable influence on the evangelical movement in the Church of England. V. was the author of a book entitled "The Complete Duty of Man," a sort of development or extension of the "Whole Duty of Man." His "Life and Correspondence" was published by his grandson, Henry Venn, in 1839.

VENOMOUS BITES AND STINGS. Under this title are considered all wounds inflicted by animals which by their bites or stings introduce poisons or irritating matter into the bodies of their victims. In this country, the subject is of comparatively little importance, since it is very seldom that the bite of our most venomous animal—the adder—is fatal; but in warmer countries, it demands the serious attention of the surgeon. Following Mr Busk, in his article on "Venomous Insects and Reptiles," in Holmes's "System of Surgery," we shall briefly enumerate the most venomous animals found (1) amongst the invertebrata, and (2) amongst the vertebrata.

(1.) Amongst the invertebrata, the most formidable poisons animals are to be found in the classes *Arachnida*, *Myriapoda*, and *Insecta*. The *Scorpions* are characterised by a prolonged, jointed abdomen, terminating in a hooked claw, which is perforated, and connected at the base with poison-glands. The larger species, which are restricted to hot countries, by their sting give rise to symptoms of great severity, and occasionally cause death. "The symptoms resemble those produced by the stings of wasps and bees in an aggravated degree, such as acute pain, a general nervous shock, attended with numbness, vertigo, occasionally temporary loss of sight, vomiting, &c.; while the local symptoms are swelling, and other signs of acute inflammation, followed, in many cases, by suppuration, sloughing, and their consequences. The remedy which appears to have obtained the greatest repute, is the application of ammonia externally, and its internal administration as a stimulant also; although it is probable that any other diffusible stimulus, combined with opiates, would be equally, if not more efficacious."—Busk, *op. cit.*, p. 921. Several species of

Scolopendra, or *Centipedes*, are regarded as highly venomous, and there is no doubt that the bites of some of the larger kinds inhabiting hot countries (especially of *S. moritana*), give rise to excessively painful consequences, although less severe than those occasioned by the sting of the scorpion. In these animals, the poison is introduced not by a caudal sting, but by perforated curved fangs, connected with the mandibles, where poison-glands doubtless exist, though their existence has not been clearly established on anatomical evidence. Although *Spiders* have long had a bad reputation for their venomous bites, it is quite certain that (with certain rare and foreign exceptions) their bite inflicts no more than a simple wound. The most ill-famed of the spiders is the Tarantula or Tarentula (*Lycosa tarentula*), a citigrade or running spider, common in South Italy. See TARANTISM. Direct experiments, however, shew that the bite of this spider merely causes a slight local irritation. There is a spider inhabiting the island of Elba (*Aranea 13-guttata*), which is said to be dangerous and even fatal to men and domestic animals; while the cork-forests of Morocco are said to be infested by an equally formidable spider, which is there known as the *Tendecaman*. It would be well if scientific travellers in those countries would obtain more definite information regarding these spiders. Amongst insects, many inflict more or less troublesome bites, while a comparatively few (and those almost, if not altogether, restricted to the order *Hymenoptera*) inflict serious injury by their stings.

In the case of the majority of biting insects, it is very doubtful whether the local discomfort is due to the introduction of poison, or is the consequence of the prolonged mechanical irritation only. In some cases, as in the ants, we know that formic acid (an irritant of great power) is introduced; and considering the prolonged irritation that follows the bites of many small insects, it is probable that there is some special acrid matter in their salivary secretion. This view is further borne out by the fact, that persons who suffer much from the bites of fleas and bugs (and the degree of annoyance varies extremely in different persons), are relieved by the local application of hartshorn, or some other preparation of ammonia. The "*Tsetse*" (*Glossina moritana*), whose ravages are so graphically described by Dr Livingstone, does not attack man, but it affords an example of an insect, very little larger than a house-fly, being able to secrete an intense septic poison, which, introduced by its bites, causes certain death to cattle, the sheep, horse, and dog, while it is innocuous not only to man but to the goat, antelope, ass, and pig, to all wild animals, and to the calf until it is weaned. Another insect, mentioned but not described by the same traveller, produces by its bite vomiting and purging in man. In the case of stinging insects, the stinging instrument consists essentially of two fine and sharp darts, enclosed in a tubular sheath, at the base of which is a poison-sac, whose contents are injected into the wound made by the darts, which are usually serrated or barbed. The consequences of the sting of a bee or wasp are too familiar to require any detailed notice; and the sting of the hornet, a much rarer insect, is of the same nature, but of an aggravated form. The sting of a bee or wasp scarcely ever proves fatal, except the insect is swallowed in a cavity in ripe fruit, or in the act of drinking, and inflicts its sting on the throat. A sting in the fauces usually excites severe and diffuse inflammation, which may extend to the glottis, and thus cause suffocation. The treatment must be prompt, and consist of scarification internally, leeches externally, and possibly tracheotomy. When a large number of any of these insects make a combined attack, the result may be fatal. For the bites and stings of all these animals, the remedy recommended for scorpion-stings must be used; namely, ammonia in some form or other, and probably sal-volatile is the best. Amongst various domestic remedies for allaying the irritation excited by these stings, are vinegar, oil, spirits, Eau-de-Cologne, the blue-ball employed by washerwomen, consisting of indigo, &c. If possible, the sting should be extracted by bringing it to view by pre-sure over the wound with a watch-key, and then seizing it by small forceps.

(2.) Among the vertebrata, the only animals capable of inflicting poisoned wounds are the ophidian reptiles or snakes. As the description of the mechanism of the poison-fangs of venomous snakes is sufficiently given in the article SZARENTE, we may pass on to the subject of the nature of the venom and its effects. The venom is described, when fresh, as a transparent, yellowish or greenish, somewhat viscid, neutral fluid, much resembling saliva in its physical character, and exhibiting no obvious indication of its virulent nature. According to Prince Lucien Bonaparte, it

contains, in addition to albuminous or mucous and fatty matters and the usual salts, a peculiar principle, to which he has given the name *echidnine* or *viperine*, which appears to be the active poisonous matter. The poison of the most deadly serpent produces no effect when introduced into the stomachs of living animals, excepting a slight irritation of the air-passages; nor is its effect more serious when applied to the surface of the skin when free from abrasion. From the experiments of Fontana "on the poison of the viper," and other observers, it seems that the venom must be introduced directly into the subcutaneous cellular tissue. When, however, properly introduced, as through its natural channel, the poison-fang, "its effects are very rapidly manifested; in fact, in some cases so rapidly as more to resemble those of prussic acid than anything else; usually, however, a brief interval elapses before the effects are shewn. These may be divided into general and local. The first symptoms in nearly all cases appear to be a general shock to the nervous system, attended with faintness, tremor, and great depression, sometimes with stupor, loss of sight, vomiting, lockjaw, and general insensibility; at the same time, great and sometimes intense local pain is set up. The limb, if the wound is in one of the extremities, rapidly swells. In severe cases, the swelling continues to spread till it reaches the trunk, or even the entire body, whose surface assumes a jaundiced hue. The gravity of the effects of the bite of a venomous snake appears to be in direct ratio to the comparative sizes of the snake and its victim, and also to the quantity of the poisonous secretion present at the time in the sacculus gland. It is also greatly governed by the situation of the wound; one on an extremity, for example, being far less dangerous than one on the face or trunk. It has been remarked that two or more wounds at distant points are more rapidly effective than when they are inflicted on one spot."—Busk, *op. cit.*, pp. 926, 927. The poison is one which seems to act primarily on the nervous system, and also to have a septic action on the tissues with which it is brought in contact; and in order to produce its effects, it must be directly introduced into the circulation.

The viper is the only poisonous snake in this country; but in other countries, there are many snakes whose bite is fatal. America possesses the rattlesnake; the East Indies, the Cobra da capello, the Ophiophagus, Daboia Russellii, &c.; and Africa and Australia are rich in poisonous reptiles. The bite of the viper presents in a mild form the typical symptoms which have been described, and is very seldom fatal. In the case of many snake-bites, however, rapid death is the general result; and should recovery take place, it will often be very protracted and imperfect.

The symptoms produced by the bites of different kinds of venomous serpents differ considerably in character as well as in intensity, although there is a general resemblance.

The treatment may be divided into local and general. The local treatment consists in the immediate application of a ligature drawn as tightly as possible above the wound—provided the situation of the latter allow of it—to prevent absorption, and the excision and cauterisation of the bitten part, and then, after bathing it with warm water, sucking or cupping it. When the position of the bite prevents free excision, the poisoned tissues must be destroyed by *Liquor Ammoniac*, or nitric acid. The general or constitutional measures consist essentially in the very free administration of the most powerful diffusible stimulants, such as hot strong brandy or whiskey and water, and ammonia (an ammoniacal preparation, known as *Eau de Luce*, is a popular remedy for snake-bites). In these cases, in consequence of the prostration of the patient, he can bear an extraordinary quantity of stimulants. For the bite of the rattlesnake, the popular treatment is to make the patient drunk—a process known as the *Western Cure*. Olive oil, freely administered, has been strongly advocated. We append in a foot-note* a few of the so-called specific remedies said to be adopted by the inhabitants of countries where the most virulent serpents abound.

VENOSA (anc. *Venusia*), a town of Southern Italy, in the province of Basilicata, 100 miles east-north-east of Naples. Its castle, which gives a picturesque effect to the quarter in which it is placed, is now in ruins. The Norman abbey of

* Decoction of Virginian snake-root; *Radix corineæ*; guano, or the *Sacra vitæ anchora*; the Tanjore Pill, whose chief ingredient is arsenic. See the article SNAKE-STONES.

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the Holy Trinity, founded by the Norman, Robert Guiscard, and consecrated in 1059, though now in ruins, is imposing from its magnitude and regularity, as well as interesting from its antiquity. But the unfulfilling interest of V. arises from its being the birthplace of Horace (q. v.). In one of the streets is a column surmounted by the bust of the poet; and many of the localities of the vicinity can be identified with the places he has immortalised. Pop. about 7000.

VENT, or Touch-hole. See GUN.

VENTILATION. See WARMING AND VENTILATION.

VENTIMIGLIA, a small fortified town of Northern Italy, in the province of Port Maurice, stands on a promontory on the sea-shore, 18 miles east of Nice. Besides an old cathedral, it contains the church of St Michel, containing two Roman milestones, and inscriptions by Augustus and Antoninus Pius. The strongly fortified castle above the town, recently repaired and strengthened, is the chief stronghold between Genoa and Nice. Wines and fruits are produced. V., the ancient *Albium Intemelium*, was the capital of the Intemelians, a Ligurian tribe; and its possession was contested in the middle ages by the Genoese, the counts of Provence, and the dukes of Savoy. Pop. 4080.

VENTNOR, the principal town on the south shore of the Isle of Wight, 10 miles south-south-east of Newport. It is situated amid the finest of the fine scenery of the Undercliff. Fossils are found in great quantity in the vicinity. With a fine southern exposure, and well sheltered from the north, V. possesses a mild climate, suitable for various classes of invalids, and has accordingly become a favorite winter and spring resort. The town is well provided with hotels and lodging-houses. Its beach is composed of beautiful yellow shingle. With these and other recommendations, V. has risen into importance within the last 30 years. Pop. (1861) 3203; (1871) 4341.

VENTRICULITES, a genus of fossil sponges, specimens of which are of frequent occurrence in cretaceous strata. They often form the nucleus around which flints are aggregated, and give their form to the flint-nodules. Indeed, it is believed by some that the flints are the metamorphosed remains of this genus, and other silicious sponges. Ventrulites are sessile, and cup-shaped, gradually opening from the base upwards. Twelve species have been observed.

VENTRILLOQUISM, the art of producing tones and words without any motion of the mouth, and so that the hearer is induced to refer the sound to some other place. It does not depend on any peculiar structure of the organs of voice, but upon practice and dexterity. The name is founded upon the mistaken supposition that the voice proceeds from the belly. The art of the ventriloquist consists mainly in taking a deep inhalation of breath, and then allowing it to escape slowly; the sounds of the voice being modified and muffled by means of the muscles of the upper part of the throat and of the palate. The ventriloquist avails himself at the same time of means such as are employed by sleight-of-hand performers to mislead the attention. Ventriloquism is a very ancient art; and is mentioned by Isaiah (xxix. 4). The Greeks ascribed it to the operation of demons, and called ventriloquists *Engastrimanteis* (belly-seers), and also *Euryklytes*, from Eurykles, a professor of the art at Athens. In modern times, a Frenchman of the name of Alexandre obtained great reputation for his mimetic representations, combined with ventriloquism and sleight-of-hand; and in England, Love was long one of the most popular ventriloquists.

VENUE is the locality assigned in pleadings in English actions at law for the acts or circumstances out of which the action arises. The rule is, that the declaration or plaintiff's pleading must set forth some venue, which is usually the county where the cause of action arose; and this shews where the trial will take place, if at all. If the other party shews that it would be more convenient and less expensive to try the action elsewhere, then he may apply to the court, or a judge, to change the venue, and thus the trial may take place in a different county from that first stated.

VENUS, the Roman goddess of Love, subsequently identified with the Greek Aphrodite (q. v.). Originally, she does not seem to have occupied a conspicuous place in the Latin religion, and scarcely, if at all, figures in the history of Rome

under the kings; a circumstance that throws no inconsiderable light on the Roman character, for it may be taken as an indication of the grave and serious disposition of the people, who highly valued matrimony and wedded joys, but cared little for the sentimental passion of love. Gradually, however, as the myth of the Trojan origin of Rome gained ground, the worship of V. emerged into importance. Aphrodite was the mother of Æneas, and Aphrodite became V.; Ares was Mars, and Mars was the national god of the Roman people; and as in the Greek mythology, Aphrodite was beloved of Ares, so, of course, V. was represented as the paramour of Mars, and thus was advanced by the poets to the dignity of the divine mother of the Roman people. Several temples were erected to her in Rome at different times and under different names, and rites were celebrated in her honor during the month of April—the spring-time of the year being thought favorable to the growth of tender emotions.

The figure of V. was a favorite subject of ancient sculptors. One of the most famous specimens extant is the *Venus de' Medici*, preserved in the Uffizi Gallery at Florence, and generally admitted to be the finest relic of ancient art. It was dug up in several places, either at the villa of Hadrian, near Tivoli, or at the portico of Octavia, in Rome, in the 17th c.; and after remaining for some time in the Medici Palace in Rome (whence its name), was carried to Florence by Cosmo III., about 1680. It is a nude statue, 4 feet 11½ inches in height, without the plinth; and from the exquisite symmetry and grace of the figure, it has become a sort of standard of excellence for the female form. The right arm, the lower half of the left arm, and a few pieces, here and there, are modern. The plinth (modern) bears a copy of the old inscription, stating that the statue is the work of Cleomenes, the Athenian, son of Apollodorus, who flourished 200—150 B.C.

VENUS. See **PLANETS**.

VENUS. See **VENERIDE**.

VENUSBERG. The name of several mountains in Germany, especially in Swabia; it appears to be met with in Italy also. It occurs for the first time, so far as is known, in a poem called the "Children of Limburg," composed in the Netherlands about 1837 (published by Van den Bergh, Leyden, 1846); but since then it is met with frequently in the literature of the 15th and 16th centuries, and has been preserved to the present day in legends and popular songs. According to these accounts, the Lady Venus holds her court in the interior of such mountains, in brilliant style, with song and dance, banquets, and all kinds of revels. Persons of earthly mould now and then visit her abode (they are always represented as *descending*), and tarry longer or shorter time, some even to the Day of Judgment, leading a life of perpetual delight; e. g., Heinrich von Limburg, a hero of the above-mentioned romance, and the noble Taunhäuser (q. v.). Yet they usually run the risk of eternal perdition; and therefore the faithful Eckhart sits before the entrance of the mountain, and warns people against entering. Nor does the condition of the sojourners always present so enticing an aspect; on the contrary, there are at times heard issuing from the mountain the lamentations of the damned; and Geiler von Kellersberg makes the witches in their night-expeditions rendezvous in the Venusberg. On putting together the various traits of these traditions, it is apparent that they originated in the mythology of the highest German antiquity. The Lady Venus is, under a name borrowed from the classical mythology, the universal Divine Mother of the old German belief, in her peculiar conception of Subterranean Goddess—the same being that appears under several other German names, each bringing forward some particular side of her character; e. g., Hilda (q. v.), the Gracious, Benign; Hilda, War; Berchta (q. v.), the Shining; Hec, the Concealed (from which our Hell is derived). In this character of goddess of the under-world, she is surrounded by the elves and other subterranean spirits, unbaptised children, fallen heroes, and the wise women devoted to her services, who, in the way of thinking of later times, were degraded to witches. The queen of Elfand, or Faery, is evidently only another form of the Lady Venus modified by a more decided mixture of Celtic and classic elements.—See Tale of Tamlane, and Thomas the Rhymer, in "Minstrelsy of the Scottish Border."

VENUS'S FLOWER-BASKET. See **ZOOPHYTE**.

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VENUS'S FLY-TRAP. See *DIONÆA*.

VENUS'S LOOKING-GLASS (*Specularia speculum*), a very pretty little annual, of the natural order *Campanulaceæ*, which has long been a favorite in flower-gardens, and is a native of corn-fields in the south of Europe. It has brilliant blue, white, or violet-colored flowers, which fold up in a pentagonal manner towards evening.

VE'RA CRUZ, or Villa Nuova de la Vera Cruz (the New City of the Real Cross), an important city on the east coast of Mexico, about 200 miles east of the city of Mexico, with a pop. of about 15,000, composed of a motley collection from many nations. The city is built in a semicircle facing the sea, and is regularly laid out; the streets, which are wider than is usual in tropical countries, running east and west from the harbor, with others crossing them at right angles. The town is well defended by a strong wall, and other substantial works, as also by the castle of St Juan de Ulloa, which stands upon an island of the same name, about half a mile from the shore. The principal buildings are the cathedral, and about 15 other churches, generally built in the Moorish style, only six of which are in use; several monasteries; the court-house and prison, which stand on one side of the great square in the centre of the city. The houses and public buildings are generally built of rubble masonry, formed of small stones, interspersed with red tiles, the whole being afterwards covered with good durable plaster, and colored with a variety of tints; and as most of the houses are in the old Spanish style, with open arcades, balconies, galleries, &c., the city presents a very picturesque aspect. There are a few good hospitals. The drainage of the city flows down open channels in the centre of the streets, which are almost on a level with the sea. This, combined with the wretched water which the inhabitants are compelled to use, the marshy and utterly barren nature of the surrounding country, and the pestilential nature of the climate generally, easily accounts for the frightful ravages of yellow and other fevers. Yellow fever is most prevalent from May till November. Although it is the chief port for all Mexico, V. C. has no harbor, but only an open roadstead between the town and the castle. The anchorage is exceedingly bad, and when the north gales, or *Nortes* (terrible hurricanes, bearing along with them clouds of sand from the sand-hills behind the town), prevail, many vessels are wrecked on the adjoining shore. A railway between this city and Mexico was begun in 1864, and completed in 1869; tramways for covered cars have also been laid down through the principal street to the railway station, a distance of $2\frac{1}{2}$ miles.

The chief exports are the precious metals, cochineal, sugar, flour, indigo, provisions, sarsaparilla, leather, vanilla, jalap, soap, logwood, and pimento; and the imports, cotton, woollen, linen, and silk goods, brandy, iron, steel, wax, quicksilver, paper, hardware and cutlery, earthenware, &c. The exports from V. C. have a value of above £3,000,000 annually; the value of the imports is considerably less.—OLD VERA CRUZ, a village to the north, was the first Spanish settlement on the coast.

VERA'TRIA ($C_{12}H_{15}N_3O_{10}$), an alkaloid occurring in cevadilla (the dried fruit of *Asagæa officinalis*), in the bulbs of *Colchicum autumnale*, and in the roots and seeds of different species of *veratrum*. Cevadilla is the source from which it is most readily obtained; and for the method of extracting it we must refer to the pharmacopœia. In a state of purity, it is a pale, gray, amorphous powder, without smell; but even in the most minute quantity, powerfully irritating to the nostrils, sometimes producing dangerous fits of sneezing. It is strongly and persistently bitter, and highly acrid; insoluble in water, sparingly soluble in spirit and ether, but readily in diluted acids. Heated with access of air, it melts into a yellow liquid, and at length burns away, leaving no residue. In France, it is much used as an internal remedy for pneumonia and acute rheumatism, and for the latter its efficacy is well established. It is given in the form of pills, containing 1-14th of a grain, of which three may at first be given daily, and the number increased up to eight or ten, unless pain in the throat or stomach, vomiting, or diarrhœa supervene, when their use must be suspended till these symptoms disappear. In this country, it is chiefly employed externally in the form of "ointment of veratria" for neuralgic affections, and for scrofulous diseases of the joints. It is an extremely acrid and violent poison, and must be prescribed with great care.

VERA'TRUM. See *HELLEBORE*.

VERB (Lat. *verbum*, a word), the name given in Grammar to that part of speech (see **PARTS OF SPEECH**) which predicates or affirms. See **SENTENCE**. As the very end of speaking is to assert or affirm something with a view to being believed or disbelieved, the part of speech which performs this office is, as it were, the soul of the sentence, and is called "the word," or verb, par excellence. Verbs affirm either some action or some state; as, "John *reads*;" "The sun *shines*;" "The book *lies* on the table." When the nature of the action requires an object to complete the sense, the verb is called *Transitive*, because the action *passes over* (Lat. *transit*) to an object; as, "The child strikes *the dog*." Some verbs complete the conception of the action in themselves, and require no complement; as, "The child *sleeps*," "The bird *flies*." These are called *Intransitive*. A distinction is attempted to be made between intransitive verbs expressing action (as *flies*, *moves*), and verbs expressing merely a state (as *sleeps*, *lies*), the latter being called *neuter* verbs. But it is often impossible to draw the line where activity ends and neutrality begins. Even in such a verb as *sleeps*, it is implied that the sleeper shows certain outward manifestations that make an impression, or act, on the beholder; when we affirm that an object *stands*, *lies*, or even only *exists*, or *is*, we in fact affirm that it "acts," in this sense. All verbs, then, agree in affirming action.

Nor can any exact or permanent division be made of verbs into transitive and intransitive. We can say whether a given verb in a particular sentence is used transitively or intransitively; but not that it is absolutely, and in itself, transitive or intransitive. It would be difficult, perhaps, to find a verb that cannot be shewn to be both the one and the other. "The child *sees* the candle," is unquestionably an instance of a transitive verb; in "The new-born child *sees*, but the puppy is blind," the same verb is unquestionably intransitive. A verb used transitively has reference to particular acts; when the action is to be *generalised*, all specification of an object is dropped, and the verb becomes intransitive. Ex., "Men *build* houses" (trans.); "Men *build*, and time pulls down" (intrans.).

Intransitive verbs generally express a kind of action that we think of, at least, as composed of a number of parts, all like each other; as, he *walks*, *runs*. Now, with regard to the particular parts, we generally find that the same verb takes an object after it; as, "He walks *a step*, *a mile*, *a long way*;" "John played *a stroke*, *a piece*, *a game*;" "He did not sleep *a wink*" (sleep being a prolonged winking). That any intransitive verb can take its cognate noun as an object, is a received doctrine. Ex., "He ran *a race*;" "They died *an easy death*."

There are two classes of transitive and intransitive verbs, related to each other, in the following way:

Intransitive.		Transitive.
he sits.	he sets	(causes to sit).
" lies.	" lays	{ " " lie).
" falls.	" fells	{ " " fall).
" rises.	" raises	{ " " rise).
" sucks.	" sonks	{ " " suck).
" drinks	" drenches	{ " " drink).
" dives.	" dips	{ " " dive).

Those in the second column are called *causative* verbs. In the ancient forms of our language, there were many more such causative verbs, formed from root-verbs by a change, generally of the vowel. In Hebrew, every verb is capable of assuming the causative form. Modern English does not stand much on forms, but employs almost any verb in a causative sense without change of any kind. Thus: "The horse *walked*;"—"the groom *walked* the horse;" "The wood *floated*;"—"raftsmen *floated* the wood down the stream."

Passive Form, or Voice, of Verbs.—Instead of "Cæsar *defeated* Pompey," we may say, "Pompey *was defeated* by Cæsar." In the former, the verb is in the *active voice*; in the latter, in the *passive voice*. In using the passive voice, the thing or person acted upon is made the subject of the sentence, and has the chief attention directed thereto; with the active voice, the doer and his action are more prominent. Of course, it is only transitive verbs that can thus have a passive voice.

One class of intransitive verbs become transitive by the addition of one of the class of words called prepositions; as, *speak—speak to*; *fall—fall upon*. Some verbs

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already transitive take prepositions simply to modify the sense; as, *set—set up, break—break down*. In such cases, the verb and preposition are to be considered as forming one compound verb, and might be written with a hyphen—*set-up, break-down*. With the addition of a preposition, what was an intransitive verb becomes capable of being used in the passive voice. Thus, "The king spoke to the duke about it"—"the duke was spoken to about it by the king." "Robbers fell upon him"—"he was fallen upon by robbers."

Not, however, in all cases. For, "The Thames runs into the sea," we could not say, "The sea is run into by the Thames." And yet, with this same verb, we can say, "The mail-train was run into by the express." The distinction seems to be, that when we think of the object as sensibly affected by the action, and wish to call the chief attention to the effect so produced, the object may become the subject, and the verb be passive.

VERBENACEÆ, a natural order of exogenous plants, consisting chiefly of trees and shrubs, but partly also of herbaceous plants. The leaves are generally opposite and simple, and have no stipules. The flowers are generally in corymbs or spikes; the calyx is tubular, persistent, inferior; the corolla hypogynous, tubular, its limb usually irregular; the stamens generally four, two long and two short, sometimes equal, sometimes only two; the ovary 2—4-celled, the style solitary, terminal; the fruit composed of 2—4 achænia united, sometimes fleshy; the seeds 1—4. The order contains almost 800 known species, chiefly tropical, some of them natives of temperate countries. *Th. V.* are allied to *Labiata* both in botanical characters and in properties, but the leaves have no oil-glands. Some are beautiful ornaments of flower-gardens and hot-houses; some are highly esteemed for their fragrance; some are used in medicine, as *Vervain* (q. v.), &c., although no medicinal plant of much value belongs to the order; the fruit of some species, as *Premna aculeata* and species of *Lantana*, is eaten; the leaves of *Stachytarpheta Jamaicensis* are used as a substitute for tea; and the timber of a number of species is valuable. To this order belongs the Teak (q. v.) of India.

VERCELLI, a venerable city of Northern Italy, in the province of Novara, stands in a fertile plain, on the right bank of the Sesia, 44 miles west-south-west of Milan by railway. It covers a wide area, is surrounded by boulevards—those on the north-west side commanding a magnificent view of the Alps—is the seat of a bishop, and has the appearance of great prosperity. The cathedral, an edifice of about the middle of the 16th c., has a library containing a collection of ancient and valuable MSS. *V.* is a thriving commercial city. Pop. (1872) 20,640.

VERDE-ANTIQUE, a beautiful stone of a dark green color, with patches of white, and sometimes also black and red. It is a kind of hard breccia, and was much prized by the ancient Romans, and is still in great favor in Italy.

VERDEN, a walled town of Prussia, capital of a duchy, in Hanover, on the right bank of the Aller, here crossed by a bridge, and on the railway to Hanover, from which it is distant north-north-west 42 miles. Pop. (1871) 6337.

VERDI, Giuseppe, the only living operatic composer of any note in Italy. He was born in 1814 at Roncole, in the duchy of Parma, where his father was a lun-keeper, and he received his musical education at Milan. His first work was a musical drama called "Oberto di San Bonifazio," which appeared in 1839; and he has since produced a number of operas, including "I Lombardi," "Ernani," "I due Foscari," "Attila," "Macbeth," "Rigoletto," "Il Trovatore," "La Traviata," "Un Ballo in Maschera," and "Aida"—some very popular. *V.*'s operas, while they abound in taking melody, and in striking dramatic effects, are characterised by noisy orchestration. In 1861, he was elected to the Italian Parliament, and in 1874 was made a senator; while in 1875 he was nominated a Commander of the French Legion of Honor, of which he was already a member. He is a member of many artistic societies, and has been decorated by the Emperor of Russia and the Khedive of Egypt.

VERDICT, in Law, is the finding of a jury as to the issue of fact raised between the parties. The usual verdict in criminal cases is guilty or not guilty; in civil cases, it is a verdict for the plaintiff or for the defendant, according to the fact.

These are called general verdicts. In some civil cases, the jury, when doubtful, or when the court directing them is doubtful how the law ought to be applied to the facts, find a special verdict, i. e., specific facts, leaving the court to draw the proper conclusion. A verdict by a jury is usually conclusive in all criminal cases, and no new trial can be had; but in civil cases, the party defeated may, within a certain number of days allowed by the practice of the court, move to set the verdict aside, and apply for a new trial on various grounds; as, for example, that the judge misdirected or misled the jury; that the verdict was against the weight of evidence, or was perverse; that the damages were too great, or too small, &c. See NOT PROVEN.

VERDIGRIS is the popular name for Diacetate of Copper ($2\text{CuO}, \text{C}_4\text{H}_2\text{O}_3 + 6\text{Aq}$), a substance which is largely used for commercial purposes, and as an external application in surgery. It is prepared on a large scale by piling up copper-plates with alternate layers of marc or fermenting grape-skins. In the course of a few weeks, the surface of the copper is covered with a crust of the salt, which is detached, made into a thick paste with vinegar, and pressed into moulds. The salt thus obtained is in the form of a bluish-green tough mass, which is not easily pulverised. The formation of the salt by this process is due to the alcohol in the grape-skins being slowly oxidised into acetic acid, while the copper absorbs oxygen from the air, and the oxide thus formed unites with the acetic acid. Verdigris may be obtained more directly by placing the copper sheets in cloths dipped in vinegar. Verdigris is permanent in the air; when heated, it first loses water, and then acetic acid, the residue being metallic copper. Water resolves it into an insoluble tribasic acetate, and a soluble subsesquiacetate of copper—a point which must be recollected in employing this salt. It is used by the surgeon as a caustic application to venereal warts and fungous growths; it is also a good application in ophthalmia tarsi, and has been of much service in stimulating old and indolent ulcers, in the ulcerated sore throat of scarlatina, and in malignant ulcer of the tongue. It may be used in the form of an ointment or a liniment. The latter, formerly known as *Mel Egyptiacum*, is composed of 1 ounce of powdered verdigris, 7 ounces of vinegar, and 14 of honey. The verdigris is dissolved in the vinegar, and to the strained solution the honey is added, and the whole is boiled to a proper consistence. It should be applied with a camel-hair pencil.

Verdigris is an active irritant poison, but is much more commonly the source of accidental than intentional poisoning, it being often formed in copper vessels used for cooking, or in the very reprehensible practice of putting copper coins into pickles to give them a fine green color. If copper vessels for cooking are kept perfectly clean, they seem not to be dangerous, provided (1) no acid matter be placed in them; (2) that the boiled materials are at once poured out, and not allowed to stand to cool in them; and (3) that the vessels are always at once cleaned. But the interior of such vessels should always be tinned, care being frequently taken that the tinning remains entire. In cases of poisoning, the best treatment consists in the free administration of white of eggs and milk.

VERDITER, a pigment which is extensively used in common painting. It is either blue or green, the latter being generally known as Bremen Green. It is formed by a very complicated process from blue vitriol, or sulphate of copper, sea-salt, metallic copper, muriatic acid, caustic potash, and water, and occupies three months in its manufacture. The blue is most valued.

VERDOXY, in Heraldry, a term indicating that a bordure is charged with flowers, leaves, or vegetable charges. Thus, a bordure argent verdoy of oak-leaves proper is equivalent to a bordure argent, charged with eight oak-leaves proper.

VERDUN, a fortified town of France, in the dep. of Mense, stands on the right bank of the river of that name, about 150 miles (direct line) east-north-east of Paris. It was fortified by Vauban, and its defences consist of a wall with bastions and a citadel. It is the seat of a bishop, has a fine cathedral, and carries on various manufactures. In November 1871, it was taken by the Germans, who thus established better communication between Germany and the troops before Paris. Pop. (1870) 15,433.

VERGE, a medieval term for a small shaft.

VERGER (Lat. *virga*, a wand), an officer of cathedral and collegiate churches,

who carries the mace, whether before the dean or other chief dignitary, in procession, or on any other ceremonial occasion. The mace, however, has no sacred significance, but is simply an emblem of dignity.

VERJUICE, a vinegar formerly much used, made from sour cider, or from the juice of the wild crab. The expressed juice of unripe grapes is another kind of verjuice used in the vine districts. Both are occasionally employed in cooking.

VERMEJO, an important affluent of the Paraguay (q. v.).

VERMES (Lat. worms), the name given by Linnaeus to one of the classes in his zoological system, in which he included all the lower invertebrate animals, whether of worm-like form or not. The study of their structure has since led to their arrangement in several distinct classes, and the Linnaean term is altogether disused.

VERMICELLI (Ital. little worms), a fine kind of Macaroni (q. v.).

VERMICULATION, checkering or chancelling formed in mason-work as an ornament, giving the appearance of being eaten by worms.

VERMIFUGES, Vermicides, or Anthelmintics, are remedies which possess the property of destroying intestinal worms, or of expelling them from the digestive canal. The only worms whose presence in the intestinal canal is so common, that the remedies for their destruction and expulsion require special notice, are the two varieties of tapeworm known as *Tænia solium* and *Tænia medicamentata*, or the *hooked* and the *hookless Tapeworm* (q. v.) the *Ascaris lumbricoides*, or *large round worm* and the *Ascaris* or *Oxyuris vermicularis*, or *small threadworm*. A few of this class of medicines are said to be useful in destroying all these kinds of worms—viz., the tapeworms, the round worms, and the threadworms. In this category, we may place *Abanthium*, or *wormwood*, whose effects are doubtful; *Sabadilla*, or *Cevadilla*; *Santonin*, or *worm-seed*, and its active principle, *Santonin* (q. v.); and *Oil of Turpentine*. As in our notices of the different human entozoa, we have referred to this article for the appropriate treatment of each, we will commence, in consequence of its greater importance, with the remedies that have been recommended in tapeworm, ranging them according to the reputations in which they stand. (1.) The root of the male shield-fern (*Aspidium filix mas*), of which the best preparation is the "Liquid Extract of Fern-root" of the *Pharm. Br.* It may be taken in the morning before breakfast, in doses of about a scruple, in the form of an emulsion with yolk of egg, syrup of orange-peel, and water; and if the worm does not come away in six hours, a brisk purgative should be administered. Generally, however, it is expelled by a single dose, in the mass, and without pain or much uneasiness. (2.) *Cusso* or *Kousso*, the flowers of *Brayera anthelmintica*, in doses of from about half-an-ounce to an ounce of the flowers (infused for a quarter of an hour in ten ounces of lukewarm water and a little lemon-juice), or of four ounces of the infusion of the *Pharm. Br.*, and following in four hours, if it has not acted, by a dose of castor oil, is a safe and very sure remedy. (3.) Decoction of the bark of the root of the Pomegranate tree (*Granati radix*). (4.) *Oil of Turpentine* (q. v.); and besides these, which are the best remedies, the seeds of the Common Pumpkin (*Cucurbita pepo*); *Kamela*, the powder adhering to the capsules of *Rottlera tinctoria*; *Santonine*, &c., have found their advocates. All these medicines should be taken fasting, or after a light supper on the previous evening.

Foremost amongst the remedies for *Ascaris lumbricoides*, Dr Cobbold places *Santonin* (q. v.); but kamela is also very efficacious in doses of from one to two drachms every four hours. Dr Waring, in his "Materia Medica," gives a long list of remedies employed with success in the East, but unknown in this country. *Ascaris vermicularis*, or the *threadworm*, is more successfully attacked locally in the rectum by injection, than by medicines administered in the ordinary method. Amongst the best forms of enemata are half a drachm of tincture of sesquichloride of iron in a little gruel, retained in the bowel as long as possible, or injections of salt and water, or of infusion of quassia. As an internal remedy, santonine is the best. The most annoying symptom occasioned by these worms, the intense itching about the lower part of the bowel, especially in the evening and at night, is best relieved by the introduction of a little mercurial ointment within the verge of the anus, when the patient retires to rest.

VERMILION, or artificial Cinnabar (q. v.), is a bisulphide of mercury, formed by mixing 100 parts of the metal with 16 parts of sulphur, and subliming them in properly constructed retorts; the result is, a heavy dull red cake, an inch or so in thickness, of acicular crystalline texture, and exactly resembling in these respects the native cinnabar. When, however, it is finely powdered, it acquires the beautiful bright red color so well known in this pigment. The finest European vermilion was, until lately, made at Utrecht in Holland, and this manufactory supplied nearly all Europe. It is now, however, manufactured in other places, particularly in Istria. A new process, invented by Kirchhoff, has also been introduced, and is employed in most manufactories, for making the finest quality. It is called the humid process, from the employment of water, with which the ingredients are triturated at a temperature of not more than 130° F., until the mixture, which is first black, turns a brownish red, when the temperature is lowered to 114° F., and steadily maintained, at that until the brightest color is obtained; it is then allowed to subside, the liquid is decanted off, and the residue washed in clean water. The Chinese have always been famous for the extreme beauty of their vermilion.

VERMIN (Lat. *vermis*, a worm), a term commonly applied to small noxious animals, particularly to those which, unless their increase is checked, are apt to become excessively numerous. Of some of the applications of this term, as to parasitic insects, it is unnecessary to say anything; but it seems proper to notice the use made of it by farmers and gardeners, with reference to quadrupeds and birds injurious to their crops, and by gamekeepers with reference to those which are destructive to game. In the estimation of the gamekeeper, all those animals are vermin which are known ever to prey upon any kind of game, or to rob the nests of game-birds. He therefore wages unceasing war against foxes, polecats, weasels, stoats, hedgehogs, hawks, falcons, ravens, carrion-crows, magpies, and even owls. The results are not agreeable to the farmer, as, the balance of nature being thus interfered with, animals destructive to his crops multiply without restraint, particularly rats, mice, and voles. The farmer is apt to regard some kinds of game themselves as vermin, especially hares (and rabbits), which, when numerous, cause him great loss. As to these, probably, there might be ready enough means found of reducing their numbers, if it were permitted, even although an undiminished assiduity should be maintained in keeping down all animals of prey. It is otherwise, however, as to the smaller quadrupeds already named, and the destruction of their natural enemies is followed by their excessive multiplication. Beasts and birds of prey have their use in the economy of nature. The larger beasts, which are dangerous to man himself, or destructive of the animals valued by him as his property, are no longer of use in thickly-peopled and extensively cultivated countries; their extirpation is therefore to be desired, and they rapidly disappear before advancing civilisation; but their use in a different state of things may be seen, if we reflect on the vast multitude of antelopes and other herbivorous animals in the wilds of Africa, which would soon cease to find sustenance for themselves, but for these destroyers. Kites, kestrels, owls, weasels, and hedgehogs are particularly useful to the British farmer, as preying upon the mice and voles, which are often extremely destructive to his crops, eating whole rows of seed-wheat and beans, proceeding from one end of the row to the other; and all the injury done to him by game, or at least by feathered game, is generally little in comparison with that which results from the continual shooting and trapping of them by gamekeepers. No expedient is known so likely to rid the fields of mice and other such pests, as to put a stop to the destruction of the quadrupeds and birds which prey upon them. The farmer himself, however, sometimes falls into the error of seeking to interfere unduly with the balance of nature—complaining of rooks as a mere nuisance, and demanding the destruction of rookeries. The money which he expends in guarding his fields from rooks at certain seasons, when they are apt to injure his crops, is more than repaid by their services at other times, in the destruction of grubs. Wood-pigeons, which have of late become extremely numerous in some parts of Britain, do more harm to the farmer than any other vermin, as they feed chiefly on grains, seeds, young clover, &c., and are very voracious; their ravages are becoming a serious consideration to farmer and landlord alike, and they are therefore justly regarded in the light of true farm-pests. Small birds, such as feed both on insects and seeds, are, like rooks, not to be regarded as vermin. They consume, it is true, a certain portion of the grain, but they are of

incalculable use in devouring those insects which are the worst of all destroyers of crops. The consequences which have ensued from the great reduction of the numbers of small birds in France, where they are eagerly sought for the table, should act as a warning to the farmers of all other countries. The most intelligent agriculturists of France are now extremely anxious for the increase of the numbers of small birds, as their only protection against caterpillars and grubs of many kinds. To give a premium for the destruction of sparrows, as is sometimes done in England, is bad policy, unless peculiar local circumstances have led to their extraordinary multiplication.

Moles are amongst the animals commonly regarded as vermin by farmers and gardeners; and in gardens they are certainly a pest; but it is probable that many pastures owe much of their long-continued fertility to the incessant stirring of the soil by moles; and when they are not excessively numerous, it may be better to undertake the labor of scattering the mole-hills, than to attempt the destruction of the creatures which throw them up.

Even rats and mice, although often amongst the most troublesome of vermin, are not, in all circumstances, to be regarded as mere pests. They are so, it is true, in fields, in houses, and in ships; but much of the refuse of towns would probably become far more offensive and injurious than it is, if it were left to putrefy, and the rats, which frequent the most filthy places, render valuable service by devouring it. Police regulations may be imagined, which, if strictly enforced, would render the presence of rats no longer desirable; but in this case, their numbers would probably soon diminish with the diminution of their supply of food.

Some of the means used for the destruction of vermin may be briefly noticed. Besides the use of cats for catching mice and rats, and of dogs, particularly terriers, to kill rats, the principal means employed are traps and poison. Of traps for rats and mice, there is great variety. The common wire spring-trap for mice, baited with cheese or scorched oatmeal, which catches them by the neck and chokes them, on their biting through a thread, in order to reach the bait, is probably the best, and is too well known to need description. The stamp spring-trap in general use for rats is equally well known, but is liable to the objection, that cats, or even dogs, may be caught in it, and have their legs broken, or be otherwise injured, when it is placed in situations to which they have access. Rats also learn to apprehend danger, and avoid the trap; their sense of smell probably guiding them, which is very acute, and apprises them of the touch of human hands. To overcome this difficulty, oil of aniseed, or oil of caraway, is often used, which seems to render the bait more attractive, at the same time that it hides the warning smell. Professional rat-catchers ascribe especial value to oil of rhodium, but it is more expensive than the oils already named. The poison most commonly used is the white oxide of arsenic, which, however, must be used with great caution, so that only the creatures for which it is intended may get at it. Pieces of bread and butter sprinkled with sugar are laid down for a day or two, and then bread and butter sprinkled with arsenic; some of the oils which have been mentioned being at the same time employed. A better mode of poisoning rats is by a preparation devised by Dr Ure, which is fatal to them, but scarcely dangerous to other animals. Hog's-lard is melted in a bottle plunged in water at a temperature of 150° F., and an ounce of phosphorus is added to every pound of lard, with a quantity of proof-spirit, to aid the mixture of the lard and phosphorus, which, when cooled, form a white mass, the spirit separating from it, so as to be fit for use again. This compound, very gently warmed, and mixed with flour and sugar, may be made into pellets, flavored with some of the attractive oils, and laid down near rat-holes. It is also used with advantage for field-mice, small pellets being scattered where they are very abundant. It is safer for this purpose than nux vomica, which is sometimes used, and more effectual than the powder of hellebore and stavesacre seeds.

In farm-yards, the precaution of placing ricks on frames or supports which mice cannot climb, is of great importance, as mice, when they get into a rick of corn, soon multiply excessively, and effect great destruction. No sticks should be allowed to rest against ricks. Corn in stacks may be secured from mice by building them on stone saddles, with an overhanging ledge, or on iron staddles, the smoothness of the iron preventing mice and rats from climbing.

The method employed with great success for destroying the field-vole, or short-tailed field-mouse, by digging pits, is noticed in the article *VOLE*.

Rats may be destroyed in great numbers in a barn, if it can be made nearly airtight, by placing in it a number of chafing dishes, filled with lighted charcoal, strewing over them bits of broken stick-brimstone; after which the barn must be quitied as quickly as possible, the door closed, and so left for two days. When the door is opened again, numerous rats will be found lying dead. Another method is that of spreading the floor with caustic potash, which, adhering to the rats' feet, is licked off. The result is obvious.

Where rats and mice are not very numerous, the trap is sufficient, but where they swarm, poison must be employed.

Rubbing the hands with a mixture of essential oils, before setting the trap, is enough to prevent the smell of the hands being noticed by rats.

A very good box-trap used for rats, and polecats, &c., is open at both ends, the doors closing when the animal runs upon a bridge in the middle. Another and very simple kind of box-trap is used for rats, open only at one end, the bait placed near the other, and connected with a string, which, being loosed whilst the bait is being eaten, the door falls. This trap, however, can secure only one rat at a time.

Mixture of oils recommended for rats: oil of rhodium, 1 scruple; oil of caraway, 1 drachm; oil of lavender, 5 drops; oil of aniseed, 10 drops; tincture of musk, 2 drops.

A stamp-trap, such as is used for rats, is used also for foxes, wild-cats, &c.—the difference being merely in size.

VERMONT (*Fr. verd mont*, green mountain), one of the U. S. of America, one of the five New England states, and the first state received after the adoption of the Federal constitution; lat. $42^{\circ} 44'$ — 45° n., and long. $71^{\circ} 25'$ — $73^{\circ} 25'$ w.; bounded on the n. by Canada, on the e. by the Connecticut River, which separates it from New Hampshire; on the s. by Massachusetts; and on the w. by New York, from which it is separated for 100 miles by Lake Champlain. It has an area of 10,212 sq. miles, divided into 14 counties. The principal towns are Burlington, Montpelier (the capital), Rutland, Bennington, Windsor, St. Albans. The surface is rather hilly than mountainous, the Green Mountains being rounded eminences 2000 to 2500 feet high, bearing vegetation, and cultivated to their summits. The rivers are the Connecticut and its western branches, and the Onion, Lamoille, and smaller streams, affording abundant water-power, and falling into Lake Champlain (q. v.). The state is studded with small lakes. The geological formations are the lower groups of azoic and Silurian. East of the Green Mountains is a bed of Devonian limestone, 20 or 30 miles wide. Drift covers the whole state. Along the western part of the state, a great belt of quartz is covered by a bed of crystalline limestone 2000 feet thick. Slates are found on Lake Champlain, with hæmatite iron, supplying several blast-furnaces. There are deposits of gold, pyritous copper ore, and at Rutland, rich quarries of statuary marble. Clay for white stoneware is found at Bennington, and there are several quarries of soap-stone. The climate is cold, with long and severe winters, but healthful—the temperature ranging from -17° to $+92^{\circ}$. The soil is a rich loam, and the country well wooded with hemlock, fir, spruce, oak, beech, sugar-maple, pine, hickory, elm, butternut, birch, cedar, &c. The hills are well adapted for pasturage. The chief products are wool, cattle, maple-sugar, butter, cheese, hay, and potatoes. In 1870, farms, of the average size of 184 acres, occupied 4,523,804 acres; and the live-stock in 1870 was valued at 23,588,835 dollars. The state has some fine scenery, and beautiful waterfalls—as Bellows Falls on the Connecticut, the Great Falls of the Lamoille, Falls of the Winooksi, a fall of 70 feet on the Missisquoi, &c. There are 799 miles of railway, two lines crossing the mountains. The chief business is agriculture; but there are 8 cotton-mills, 65 woollen-mills, and manufactures of lumber, machinery, leather, bar and pig iron, scales, &c. V. has 744 churches, or 1 to every 444 inhabitants; the University of V. at Burlington, and 8 other colleges, with several theological and medical institutions, 41 academies, 3 normal schools, and 2830 public schools, with an attendance of 52,067; 48 weekly, and 3 daily newspapers. The government is of the usual republican form of the American states. The governor has a salary of £200, the state-treasurer, £100; and the secretary of civil and military affairs, £55, a year. There

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are two houses of the legislature, elected by "every male citizen of peaceable behavior, 21 years old, and 1 year resident in the state." The first settlement in V. was in 1724, when it was claimed as a part of the New Hampshire grants. In 1763, it was claimed by New York, under grants of Charles II. to the Duke of York. For ten years, the New York officers were resisted, and sometimes tied to trees and whipped by the lawless settlers. These contests were stopped by the Revolution; but V., a refuge for settlers from the other states, remained eight years out of the union. It was chiefly the V. militia that gained the victory of Plattsburg, on Lake Champlain, in 1812; and the Green Mountain state contributed very largely to the Union forces in the War of Secession. The population, one-seventh of which consists of persons of foreign birth, mostly from Ireland and Canada, with a very slight increase, owing to the large emigration to the western states, was in 1870, 380,551: in 1880, 332,236.

VERNAL GRASS, Sweet (*Anthoxanthum odoratum*), a grass very common in Britain and throughout Europe, and the northern parts of the world generally, growing in meadows, woods, and pastures. It is about a foot high, with spiked oblong panicle, the flowers remarkable as having only two stamens. The spikelets are 1-flowered; the glumes very unequal; the floret accompanied with two rudimentary florets, which botanists have very generally described as two outer paleæ. This grass flowers earlier in summer than most European grasses. It is relished by cattle, and is sown along with other grasses to form permanent pastures. The pleasant smell of newly-mown hay is often chiefly owing to this grass, which is fragrant when drying, and contains COUMARIN (q. v.). It yields, by distillation, an essential oil of an agreeable odor. The straw of this grass is of use for the finest kinds of straw-plaiting.

VERNATION, in Botany, a term employed to designate the manner in which the leaves are arranged in the leaf-bud. It corresponds with ESTIVATION (q. v.) in the flower-bud. There are great differences in the vernation of plants, and these differences are characteristic not only of species but of genera, and even of natural orders, but the vernation of the same species is always the same. The vernation of plants is very interesting; in some, the leaves are very simply placed together; in others, they are most curiously folded, rolled, or plaited, and interlaced with each other, yet so as to separate most readily when the proper time for their expansion comes.

VERNET, Émile-Jean-Horace, a celebrated French painter of battle-pieces, in whom may be said to have culminated the talent of a family through several generations distinguished in the sphere of art. His grandfather, CLAUDE JOSEPH, born in 1714, was a native of Avignon. By Antoine Vernet, his father, also a painter, Claude Joseph was early initiated in art, and going at the age of 18 to Italy, he remained there 20 years. Towards the end of that period, much of which had been passed in struggle and privation, his reputation as a landscape and marine painter had become so high, that he was invited to Paris by Louis XV., who assigned him apartments in the Louvre. Between this time (1752) and his death in 1789, he painted an immense number of pictures, one of his chief undertakings being a series of large pieces commissioned by government, representing the chief seaports of France. These were 15 in number, and are still to be seen in the Louvre, with many other of his best works. During his life, he was held to be, in France, without a rival in his own department; and an honorable rank continues to be assigned him among the painters of his country. He married at Rome an English lady, a Miss Parker, by whom he had a son, ANTOINE-CHARLES VERNET, born at Bordeaux in 1753, and popularly known as Carle Vernet. Carle received his education, in the first instance, from his father, and afterwards at the Academy of Paris, where, in 1779, he gained the chief prize, which brought with it the privilege of which he availed himself, of studying for some years in Rome. His subsequent success in Paris was great; he achieved the highest honors of his profession, became Chevalier of the order of St Michel, as also of the Legion d' Honneur, and died September 27, 1836. He was especially celebrated as a painter of horses; but his chief works were battle-pieces on a large scale, chiefly commemorative of the triumphs of the great Emperor, and as such, amazingly popular with the Parisian public. The principal are—"The Battle of Marengo," "The Morning of Austerlitz," "The Emperor giving orders to his Marshals," "The Bombardment of Madrid," "Battle of Rivoli," "Entrance of Napoleon into Milan," and "Battle of Wagram."

The youth of HORACE VERNET, his son (born in Paris, June 30, 1789), was passed amid the tumults and anarchy of the Revolution; and his general education was as irregular and incomplete as in such an element we might suppose it; but he had in his father a capable instructor in art, the hereditary genius for which very early became noted in him. It was the wish of his father that as he had himself done, his son should go to study at Rome; but he failed in the competition for the travelling-pension for that purpose, given by the *Académie des Beaux Arts*, and the scheme was necessarily abandoned. Undepressed by his disappointment, the young V. married, and commenced his independent career as a painter, being then (1809) only 20 years of age. The *voie* which he chose was that suggested at once by the previous success of his father, and the military intoxication of the Parisian public. Young as he still was, he had served for some time as a soldier, not, so far as is known, with any special distinction, yet, doubtless, with such practical experience of the detail of a soldier's life in the field, as would be found exceedingly available in his efforts for distinction of another kind. Whereas the treatment of military subjects by his father and others had been, hitherto, more or less of the conventional and so-called imaginative kind, more properly to be called imaginary, the new aspirant, with his fuller sympathy and knowledge, sought for his effects in that serious rendering of truth which is the basis of all authentic imagination. In the halt, the bivouac, or the battle, the French soldier should be painted according to the veritable fact of the matter, as V. himself had seen, or could rigorously so conceive it. The success which rewarded this attempt at more earnest and truthful conception, was brilliant and instantaneous, his very first pictures of the kind—"The Dog of the Regiment and the Horse of the Trumpet," "Capture of the Redoubt," "Halt of French Soldiers," &c.—being received with an enthusiasm of favor accorded to those of no other artist. In 1812, to confirm this popular approval, the first-class medal was awarded to him; and in 1814, he had the title conferred on him by the Emperor of Chevalier of the Legion d'Honneur. The unrivalled popularity which he had thus at a bound achieved, ever afterwards remained with him; and the favor which he enjoyed from the Emperor, whose victories he signalized on his canvas, was continued to him by the restored dynasty, whose sympathy with these favorite subjects, which, as occasion served, he continued as before to paint, could only be supposed imperfect. By Charles X. he was, in 1825, made Officer of the Legion d'Honneur; and in the next year, he was elected Member of the Institute. In 1827, he was appointed Director of the French Academy at Rome, whither he went to reside. He remained there for several years; and on the withdrawal of the French Legation, occasioned by the revolution of 1830, he was appointed to act as representative of his country at the Roman court.

With Louis Philippe, the services of V. were in especial request; and one of his most gigantic undertakings, the grand series of paintings in the Constantine Gallery at Versailles, commemorative of the triumphs of the French arms in Algeria, was a task prescribed him by that monarch. In pursuance of this object, he more than once visited Algeria; as, indeed, throughout his career, he frequently became a traveller on similar professional errands. To the last, honors continued to flow upon him. In 1842, he was made Commander of the Legion d'Honneur; and in the Universal Exposition of 1855, the grand Medal of Honor was awarded to him. He died January 17, 1863. He left behind him no children; his only daughter, wife of the celebrated Paul Delaroche, having died in 1846.

Though he by no means exclusively confined himself to military subjects, as witness his well-known "School of Raphael," "Judith and Holoternes," and many others, it is on his consummate treatment of these that his fame mainly rests; and in this particular department, though he has many worthy competitors among his countrymen, no one of them can be said to equal him. With the utmost skill in effective composition, he combines in these works a surprising dash, vigor, and truthfulness; the movement and veritable fiery life of conflict is expressed in them with amazing effect. In the London International Exhibition of 1862, some good specimens were exhibited.

VERNIER, a scale, by which linear or angular magnitude can be read off with a much greater degree of accuracy than is possible by mere mechanical division and subdivision, derives its name from its inventor, Pierre Vernier, "Capitaine et Omblesaine pour sa Majesté au Chateau Dornana," who gave a description of it in a

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tract published at Brussels in 1631. The principle of this invention is essentially as follows: AB (fig. 1) is a portion of the graduated scale of an instrument shewing

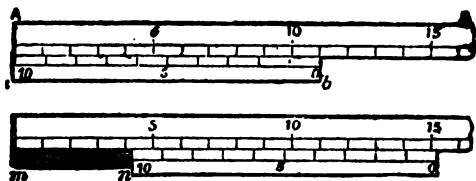


Fig. 1.

divisions and subdivisions; *ab*, a small scale (called the *vernier*), made to slide along the edge of the other, and so divided that *ten* of its subdivisions are equal to *eleven* of the smallest divisions of the scale AB; then each division of the vernier is equivalent to $1\frac{1}{10}$ th of a subdivision of AB; and consequently, if the zero-point of the vernier be (fig. 1, A) opposite 11 on AB, the 1 on the vernier is at $9\frac{9}{10}$ ths ($1\frac{1}{10}$ th below 11), 2 on vernier is at $8\frac{8}{10}$ ths ($2\frac{2}{10}$ ths below 11), &c. Also, if the vernier be slid along so that 1 on it coincides with a division on the scale, then 0 on the vernier is *one-tenth* above the next division on the scale; if 4 on the vernier coincide with a division on the scale, the 0 of the vernier is *four-tenths* above a division. The vernier is applied to instruments by being carried at the extremity of the index-*limb*, the zero on the vernier being taken as the index-point; and when the reading-off is to be performed, the position of the zero-point, with reference to the divisions of the scale, gives the result as correctly as the mechanical graduation by itself permits, and the number of the division of the vernier which coincides with a division of the scale, supplements this result by the addition of a fractional part of the smallest subdivision of the scale. Thus (fig. 1, B), suppose the scale-divisions to be degrees, then the reading by the graduation alone gives only a result between 15° and 16° ; but as the 2d division of the vernier coincides with a graduation on the scale, it follows that the zero-point is $\frac{2}{10}$ ths of a division above 15° , and that, therefore, the correct reading is $15^\circ 2'$. It will be at once seen that by merely increasing the size of the vernier, as, for example, making 20 divisions of it coincide with 21 on the scale, the latter may be read off to $\frac{1}{20}$ ths; and a still greater increase in the size of the vernier would secure further accuracy.

The above is the vernier as proposed by its inventor, and as it was employed for long after his time; but in the more recently constructed astronomical and geodesical instruments, a vernier is employed which has one graduation *more* than the corresponding portion of the scale. A little consideration will shew that the only effect of this modification is to enable the vernier to be graduated towards the same direction as the scale, and thus save a little confusion in the reading off. In small instruments, or where the utmost accuracy is required, a small magnifying lens is fixed over the vernier, to enable the observer, in cases where no two graduations coincide (which is generally the case), to estimate the amount of error introduced by assuming that the two graduations which approach nearest to coincidence actually coincide.

Of the various methods for subdivision which were in use before the introduction of the vernier, the most important were the *Diagonal Scale* (q. v.) and the *Nonius*. The latter, so called from its inventor, Petrus Nonius (Pedro Nunez), a Portuguese mathematician, who described it in a treatise "*De Circunculis Olyssipone*," published in 1542, consists of 45 concentric circles described on the limb, and divided into quadrants by two diameters intersecting at right angles. The outermost of these quadrants was divided into 90, the next into 89, the third into 88, &c., and the

last into 46 equal parts, giving on the whole a quadrantal division into 2532 separate and unequal parts (amounting on an average to about 2' intervals). The edge of the bar which carried the sights passed, when produced, through the centre, and served, consequently, as an index-limb; and whichever of the 45 circles it crossed at a graduation, on that circle was the angle read off; for instance, if it cut the 7th circle from the outside at its 43d graduation, the angle was read off as 48-84th of 90°, or 48° 4' 17 1/7".

VERNON, a small town of France, in the dep. of Eure, stands on the left bank of the Seine, 50 miles west-north-west of Paris by the Havre, Rouen, and Paris Railway. It contains a handsome Gothic church, and numerous picturesque old houses with wooden frameworks, and is the seat of some trade in grain. Pop. (1876) 6384.

VERONA, an ancient and interesting city of Northern Italy, in Venetia, stands on a plain at the foot of the hills which lie at the base of the Tyrolese mountains, 72 miles west of Venice by railway. It stands on the Adige, by which it is divided into two unequal parts, connected by four bridges. The aspect of the town, and of rich landscape around, is considered remarkably fine. V. is a fortress of the first rank, a member of the famous Quadrilateral (q. v.), and has always been considered a place of strength since it was surrounded with walls by the Emperor Gallienus, 263 A.D. Its modern fortifications are amongst the most extraordinary works of military engineering in Europe. After passing into the hands of the Austrians in 1315, it was greatly strengthened; and after 1849, they made every effort to render it impregnable. Of its many interesting edifices, the chief is the amphitheatre, built, it is supposed, between the years 81 and 117 A.D. The building has been wonderfully preserved, the interior being still, to all appearance, complete. The lesser diameter of the building is 404 feet, that of the arena 146 feet; and the edifice is calculated to have contained 22,000 people. This, as well as many of the other structures of the city, has a handsome appearance, owing to having been built of Verona marble. The Porta del Borsari and the Arco del Leon are fine Roman gateways, both of the imperial age. The streets of V. are wide, especially the Corso; there are four principal squares, of which the Piazza dei Signori contains the palace of the Della Scala and the superb Palazzo del Consiglio, the facade of which is adorned with bronze and marble statues of celebrated natives of V., including Catullus, Pliny the Younger, &c. The picture-gallery contains about 400 specimens, including a Transfiguration by Titian, and a full-length portrait and a Deposition by Paul Veronese. The cathedral, the date of which is uncertain, but which is attributed to Charlemagne, has a handsome porch, guarded by the celebrated paladins, Roland and Oliver. The more modern parts of the cathedral are exceedingly rich, and among other excellent works of art, it contains a famous Assumption by Titian. Altogether, there are in V. about 40 churches, many of them beautiful specimens of Gothic architecture, and containing valuable paintings and other art treasures. The palaces are also numerous and fine; and there are several theatres, hospitals, &c. Manufactures of woollen goods, hats, cotton, silk, hemp, and hosiery are carried on; and the town trades considerably with Venice in garlic sausages. Excellent cattle are reared on the rich pasturage of the vicinity. Wines and fruit are good and abundant. Pop. of V. and suburbs (1872) 65,876.

The early history of V. is involved in obscurity, and there is some difficulty in determining whether it originally belonged to the Euganei or the Cenomani. It afterwards fell into the hands of the Romans, and under the Empire became one of the most flourishing cities in the north of Italy. Constantine took it by assault in 312; Stilicho defeated the Goths here in 402. Charlemagne took possession of it, and made it the royal residence of his son, King Pepin. The Montagues, who were Ghibellines, lived here in perpetual and deadly enmity with the Guelph Capulets; and from the contentious that took place between these families, Shakespeare—drawing upon an Italian authority—has derived materials for his tragedy of "Romeo and Juliet." In 1259, the town received Mastino della Scala as its ruler. In 1405, the city gave itself over to Venice, in order to free itself from its tyrants, who were alternately of the Scala, the Visconti, or the Carrara families. It has since shared the vicissitudes of the rest of Venetia, and in 1866 was ceded to Italy.

VERONESE, Paul. See **CAGLIARI**.

VERONICA, the name of a supposed saint of the Roman Catholic Church, whose history, and indeed whose historical existence, has been the subject of much controversy. According to the legend, V. was one of the women who met our Lord on his way to Calvary; and as he was sinking, overpowered by fatigue, under the weight of the cross, V. offered him her veil, to wipe the sweat from his brow, when, wondrous to tell, the divine features were miraculously impressed upon the cloth, and remained as a permanent picture of the face of our Lord. This miraculous picture is reported to have been preserved in Rome at St Peter's Church from about the year 700. Another, of similar appearance, is preserved at Milan; and many Catholic writers, among whom are the learned Mabillon and Papenbrook, have supposed that whatever is to be said of the legend of the pious woman at Jerusalem, the name "Veronica" is but founded on an erroneous application of what in reality was meant to designate not the personage, but the picture, which was described as *vera icon* (Gr. *eikon*), "the true image" (i. e., of Christ). Other writers, however, are of opinion that V. is a real name, and designates a real personage, although probably erroneously applied in this legend. The picture has been frequently reproduced both in painting and engraving; the most celebrated of the former is one by the great Spanish painter Morales, surnamed "the Divine," from his favorite subject, which was the countenance of our Lord in the "Ecce-Homo" and similar subjects.

VERONICA. See **SPEEDWELL**.

VERSAILLES, a celebrated city of France, and long the residence of the French court, capital of the dep. of Seine-et-Oise, stands on a plain, 11 miles south-west of Paris by railway. A fine avenue, which forms part of the road from Paris, divides the town into two parts. The town covers a large area in proportion to its population, and is of remarkably regular construction, consisting of long and straight streets, crossing at right angles. V., a city more of pleasure than of industry, long accustomed to find its splendour in the expenditure of a luxurious court, and subsequently a place of residence for many foreigners, attracted hither by the salubrity of the climate, the fine promenades, and the economy of living, as compared with that in Paris—has few manufactures, and little trade. It is the see of a bishop, and contains a public library of 50,000 vols., many palatial edifices, public fountains, spacious squares, and elm-planted avenues; and when taste in architecture and in landscape gardening was more formal than at the present time, the town was esteemed the handsomest in Europe. The great attraction of V. is its palace, and the history of this structure may be said to be the history of the town. The site occupied by the palace is known to have been that of the ancient priory of St Julien, the chronicles of which place the date of the building in the early times of the Capetan monarchy. Later, the priory became a feudal stronghold, and its first superior, *Hugo de Versa'itis*, lived in the 11th century. In 1570, the manor belonged to Martial de Léonéme, one of the victims of St Bartholomew. The building was converted by Louis XIII. into a château; and Louis XIV. devoted enormous sums to its embellishment, or rather reconstruction. Louis XV. altered the arrangement of the interior, and meditated alterations that would have changed the whole character of the edifice, but which he was unable to carry out from want of money. Under Louis XVI., V. continued to be one of the usual residences of the court down to the period of the Revolution, which great event had its beginning here in the meeting of the States-general, in May 1789. Louis Philippe transformed the palace of Louis XIV. into a museum, to contain trophies of the victories of France. The approach to the palace is by the *Place d'Armes* and the *Cour d'Honneur*, in the latter of which is a large equestrian figure of Louis XIV., and other statues. The entire length of the palace is nearly 1400 feet. The collections embrace pictures of events in French history, portraits of French heroes, &c. The most interesting are the pictures by David which illustrate the career of Napoleon, and those by Horace Vernet. The gardens, with their broad terraces and long alleys, are imposing, but formal; the fountains are on the grandest scale. From the middle of September 1870 till the conclusion of peace in 1871, V. was the centre of all the operations of the Germans. On September 20, King William and the Crown-Prince entered the town; and there, on January 18, 1871, the former was proclaimed Emperor of Germany. On January 23, the capitulation of Paris was

signed in V.; after the peace, it became the seat of the National Assembly and government of the republic, and was the headquarters of the Army under General Marmahon. Pop. (1876) 49,522.

VERSE (Lat. *versus*, from *verto*, to turn, a turning of the plough, a furrow; a row; a line in writing and in poetry), a section or group of metres written in one line. See **METRE**, **RHIME**. The term Verse is often erroneously applied to a group of lines or verses, which is properly a stanza. Verse is often used to signify metrical composition.

VERSECZ, a town of the Temesvar county, Hungary, stands on the Versecz Mountains, 45 miles south of Temesvar by railway. It is the seat of a Greek Non-united bishop. The chief industry is the production of silk, wine, and rice. Pop. 21,095.

VERSICLE (Lat. *versiculus*, a little verse), a short verse in the service, which is spoken or chanted by the priest or minister alternately with a "response" by the people.

VERSIONS. See **BIBLE**.

VERST, or **Werst**, in Russian, *wersta*, an itinerary measure, equivalent to 1166½ yards, or about two-thirds of an English mile.

VERT. See **HERALDRY**.

VERTEBRÆ. See **SPINAL COLUMN** and **SKELETON**.

VERTEBRATA, the highest and most important of the animal sub-kingdoms, characterised by the universal presence of a back-bone, composed of a varying number of small bones called vertebrae (See **SKELETON** and **SPINAL COLUMN**), which at once serve for the general support of the other parts, and for the protection of the central part of the nervous system (the brain and spinal cord) in a closed cavity in the interior.

We shall notice first the developmental and then the structural peculiarities of the vertebrates. Like the members of the other sub-kingdoms, the vertebrates begin in a semi-fluid nitrogenous substance called plasma, which separates itself (or differentiates, as it is scientifically termed) into albumen, fibrin, primary membrane (the lemma of Owen), nuclei, and cells, in which form, says the above-named physiologist, "the individuality of the new organism first dawns as a nucleated germ-cell, or germinal vesicle." The formation of yolk by the evolution of albuminous granules and oil-particles from the plasma, and the development of an outer layer of membrane, complete the unimpregnated egg. For further development, another principle, the spermatozoon, or product of the sperm-cell, is required. Its reception by the egg is followed by the formation of a germ-mass, which is formed by consecutive divisions, cleavages, or segmentations of the impregnated centre, which incorporates more or less of the yolk. Thus far there is no difference between the vertebrate and the invertebrate germ. The next step, to use the words of Professor Owen, "impresses upon the nascent being its vertebrate type." As has been shewn in the article **DEVELOPMENT OF THE EMBRYO**, the parietal portion of the germ becomes raised up on each side into a ridge, so that a long groove or furrow is formed between these parallel ridges, and the margins of these subsequently uniting with one another, constitute a tube, in the interior of which the vertebrate cerebro-spinal nervous centres are developed. In the meantime, the margins of the germs extend downwards over the yolk till they meet and form the abdominal cavity. Hence, in the vertebrates, there are developed from the *chorda dorsalis*, or *notochord* (see **DEVELOPMENT**), "a pair of plates 'neurad,'" to enclose the nervous axis, and a pair of plates 'hemad,'† to enclose the vascular axis and organs of vegetative life. Flesh and skin co-exist with the enclosing plates. This formation of two distinct parallel cavities—neurad and hemad—under symmetrical guidance, in the vertical or 'neuro-hæmal' direction, with a repetition of parts on the right and left sides, establishing transverse or 'bi-lateral' symmetry, constitutes the chief developmental characteristics of the vertebrate ani-

* Backward in man, upward in beasts.

† Forward in man, downward in beasts.

mal."—Owen's "Anatomy of Vertebrates," vol. 1. p. 2. "It will be observed," says Professor Huxley, "that the alimentary canal is in the middle, the principal centres of the nervous system upon one side of it, and the heart upon the other. In none of these animals, again, would you discover in the embryonic state any partition formed by the original external parietes of the body between the nervous centres and the alimentary canal."—*Op. cit.*, p. 59. But the vertebrate, after it has passed through its very earliest stages of development, is, as we have seen, not a single, but a double tube; and the "two tubes are separated by a partition, which was, primitively, a part of the external parietes of the body, but which now lies in a central position between the cerebro-spinal nervous centres and the alimentary canal. Hence a transverse section of any vertebrate animal may be represented diagrammatically, where, for the most part, the letters have the same signification. The visceral tube contains, as in the case of the invertebrate animal, the alimentary canal, the heart, and certain nervous centres belonging to the so-called sympathetic system. This nervous system and the heart are situated upon opposite sides of the alimentary canal, the sympathetic corresponding in position and in forming a double chain of ganglia with the chief nervous centres of the invertebrate; so that the cerebro-spinal tube appears to be a superaddition—a something not represented in the invertebrate series. In close connection with the profound difference between the chief nerve-centres of the vertebrate and the invertebrate, is another remarkable structural contrast. In all the higher invertebrates, with a well-developed nervous system, the latter is perforated by the gullet, so that the mouth is situated upon the same side of the body as the principal masses of the nervous system; and some of the ganglia of the latter lie in front of, and others behind the oesophagus."—*Op. cit.*, p. 60. No structures having any analogy to the *chorda dorsalis*, or *notochord*, or to the *visceral arches and clefts* (see SKELETON), are to be found in the embryonic condition of any of the invertebrates.

Passing on from the developmental to the structural differences, we universally have the vertebral column and the nervous centres, consisting of brain and spinal cord; and the organs of the five senses are usually present. All possess a distinct vascular system, containing blood, with red and white corpuscles in suspension, and in all (with the solitary known exception of the *amphioxus*, or *Laurelet*), there is a compact muscular heart of two or more cavities, and provided with valves. The breathing organ communicates with the pharynx. The alimentary canal has two apertures, usually at opposite ends of the trunk, the mouth or reception aperture never being formed of modified limbs, or working horizontally, as in the *Articulata*, but provided with two bony jaws, placed one above the other, and acting vertically.

All vertebrates possess a hepatic portal system, by which the blood of the alimentary canal is collected into a portal vein, which ramifies through the liver. The limbs may be totally absent, or one or two pair, never more. The muscles surround the bony levers on which they act, and thus, under the influence of the will, move the limbs and other parts. The sexes are distinct.

Comparative anatomists differ in their division of the vertebrates into classes, and as to the best basis of classification. Professor Owen, in his "Anatomy of Vertebrates," admits of only four classes, viz., Fishes, Reptiles, Birds, and Mammals; whereas Milne-Edwards, Huxley, and many of our leading authorities, separate the Amphibians from the Reptiles, and assign them a class by themselves. Professor Owen, after describing the modifications of the piscine, reptilian, ovian, and mammalian types, observes that the vertebrates might be binarily divided into oviparous and viviparous; into anallantole or branchiate, and allantole or abbranchiate; into *Hæmatothermal* (Gr. *haima*, blood, *thermos*, hot), having four-chambered heart, spongy lungs, hot blood, and *Hæmatocrysal* (Gr. *haima*, blood, *crysal*, cold), having less perfect breathing organs, less complex heart, with cold blood; and adopts the latter. Huxley, on the other hand, after noticing the division of the vertebrates into *Branchiate* and *Abranchiate*, and pointing out the non-homogeneous character of the abbranchiates—Mammals being so strongly separated from Birds and Reptiles—suggests the removal of them to an independent position. "Thus," he observes, "the classes of the *Vertebrata* are capable of being grouped into three provinces: (1.) The *IOHTHYOIDS* (comprising Fishes and *Amphibia*), defined by the presence of branchie at some period of existence, the absence of an amnion, the absence of a rudimentary development of the allantole, nucleated blood-corpuscle, and

a parasphenoid bone in the skull: (2.) the SAURIANS, defined by the absence of branchiæ at all periods of existence, the presence of a well-developed amnion and allantois, a single occipital condyle, a complex mandibular ramus, articulated to the skull by a quadrate bone, nucleated blood-corpuscles, and no parasphenoid, comprising Reptiles and Birds; and (3.) the MAMMALS, devoid of branchiæ, and with an amnion and an allantois, but with two occipital condyles, and a well-developed basioccipital, and no parasphenoid, a simple mandibular ramus, articulated with the squamosal, and not with the quadratum, with mammary glands, and with red non-nucleated blood-corpuscles."—*Op. cit.*, p. 74.—For further details, the reader may consult Stannius's "Comparative Anatomy of the Vertebrata" (in German), Wagner's "Comparative Anatomy of the Vertebrata," translated from the German by Tulk; the works of Huxley and Owen quoted in this article; and the special departments of Cuvier's "Règne Animal," and Blanchard's "L'Organisation du Règne Animal," now in course of publication—a work which, if ever completed, will rival Cuvier's *opus magnum*.

VERTIGO, in Medicine, designates a sensation which the patient describes as one of going to fall, or of turning round, or of everything turning around him. It comes on without premonitory symptoms, excepting a sense of disturbed balance, which may either precede, accompany, or follow it. Associated with it are frequently some of the following symptoms: flashes of light before the eyes, buzzing in the ears, painful sensations in the head, nausea, vomiting, trembling with cold perspirations, muscular tremors, a full, slow, or small and frequent pulse, flushing or pallor of the face, and cold feet.

Giddiness and dizziness are only other names for vertigo, although giddiness is commonly applied to its milder forms. Attacks of it come on in paroxysms, usually repeated several times a day, and lasting from a few minutes to a quarter of an hour. This disease is frequently chronic, the chief predisposition to it being in middle and advanced age. Childhood is nearly exempt from it, an observation in accordance with the well-known fact, that children can bear rapid rotatory movements without the induction of giddiness better than adults. A plethoric constitution, especially if associated with a sedentary mode of life, the so-called change of life in women, the debility brought on by exhausting discharges, and the abuse of spirituous liquors, may be regarded as predisposing causes to this affection. The direct cause of vertigo is doubtless an irregularity of the supply of blood to the brain. Hence any condition that occasions either an increase or diminution in the supply of blood, is followed by vertigo. For example, it commonly accompanies disease of the heart, and especially hypertrophy of the left ventricle; it is also induced by suppressed hæmorrhoids, or other constant form of discharge or loss of blood. Injuries and diseases of the brain, and especially of the cerebellum, are often accompanied by this symptom, and so also are diseases of the spleen. Amongst the most common exciting causes are intoxication, not only from alcoholic drinks, but from narcotics, such as smoking tobacco, inhaling carbonic acid gas, or semi-poisoning by belladonna, digitalis, hyoscyamus, &c., gorging the stomach with indigestible food (especially if highly carbonated drinks are at the same time taken); unusual movements or positions of the body, and especially of the head, as in sea-voyages, continued stooping, &c.

There is a peculiar kind of vertigo which occurs in dreams. The direction of the apparent movement is generally from above downwards; dreams of tumbling down stairs being, according to Romberg, the most common; people also dream of sinking into the earth, of chasms opening before them, &c.

According to Boerhaave, "vertigo is the most easily cured of all the diseases of the head." This statement is too positive; the vertigo that is caused by profuse discharges and exhaustion is curable, while it is beyond the aid of treatment when it accompanies cerebral disorganisation. The treatment of course depends upon the cause; while in some cases tonics (the mineral acids, small doses of nuxvomica, quassia, &c.) are required, in others, the local abstraction of blood from the nape of the neck, cold affusion, &c., are required. The following rules are, however, generally applicable for the treatment of patients subject to giddiness. They should avoid violent, continuous, or rotatory exercise, abstain from highly nutritious or heating articles of diet, and from suppers; they should not indulge in much sleep.

or the use of feather-beds, or of warm baths. Counter-irritation to the skin by sinapisms, foot-baths with mustard, the use of the flesh-brush, with cold washing of the body, and the administration of cooling laxatives, are to be recommended. (A good laxative of this kind is obtained by mixing six drachms of sulphate of magnesia [Epsom salts] with two drachms of carbonate of magnesia, and taking a tea-spoonful three times a day.) When the patient feels the attack coming on, Romberg directs that he should "direct his full attention to movement. The patients do this, in a measure, of their own accord, by supporting themselves firmly with their hands and feet, in order to resist the illusory movement. The sense of vision may be employed for the same purpose; thus, the vertigo produced by rotatory movement of the body may be suppressed by looking steadily at the finger held up to the eye, or by turning round in a direction opposite to the previous movement."—"On Diseases of the Nervous System," Syd. Soc. Ed. vol. 1, p. 152.

Few of our readers are probably aware of the remarkable vertiginous conditions which they can artificially induce in their own persons. Parkinje, the well-known anatomist and physiologist, was the first who brought these remarkable facts within the range of experimental science in two Memoirs published in 1830 and 1837. Vertical vertigo is thus produced. The experimenter—who must be standing—takes a somewhat heavy weight attached to each hand, and as he carefully watches the sensation produced by gravitation for some time, he feels the weights growing heavier and heavier, till he can no longer bear them. On putting them down, when he feels he can bear them no longer, it appears to him as if he was impelled to mount straight upwards, and as if the arms were shortened, and the hands must creep up to the thorax. Similar experiments with the muscles of the eye afford still more striking results. "If the face," says Parkinje, "be turned to the ceiling, and the eye be fixed on a given point, round which, as the pole of a vertical axis, the body is turned a certain number of times, the visible objects of the ceiling, as well as the floor of the room, will, if the position of the head and the direction of the eyes be maintained, appear to move in a horizontal direction. If, during the proceeding, the head be brought back into the ordinary upright position, the horizontal will be turned into vertical vertigo; and this sensation will be communicated to the tactile sense of the hands and feet, the floor appearing to sink down on one side, and to rise on the other."—See Rust's "Magazine," &c., 1827, vol. xxiii. p. 290.

An analogous effect is produced by standing on the brink of, or in, a running stream, and fixing the eyes on the water; after a time, the sensation begins all at once of being borne along against the current. When this sensation comes on in wading in a river, it is very difficult to keep one's feet; and hence it is dangerous to let the eyes rest on the current close by.

Hitherto, we have spoken of vertigo merely as a sensation; but there are certain morbid conditions of the brain, and certain operations which experimental physiologists can perform upon it, that will give rise to what may be termed *vertiginous movements*, if we include under the term vertigo *straight* as well as circular movements, as is usually done by writers on this subject. From the experiments of Magendie and Flourens, which have been confirmed by Krauss and Hertwig, it follows that: 1. Removal of both corpora striata of the brain induces an irresistible tendency to advance, the animal shooting straight forward like an arrow; 2. Slicing the cerebellum, whether horizontally or vertically, causes the animal to walk backwards; 3. Section of the corpora quadrigemina of one side, and of one side of the pons varolii, excites rotatory movements and gyrations of the animal towards the injured side; while division of the corresponding parts on the opposite side restores the balance. Vertiginous movements consequent on disease were described by the veterinary surgeons in sheep before they were noticed in the human subject. The *Cænurus cerebralis*, which is now known to be the larva of a species of tapeworm (*Tænia cænurus*) infesting the dog, is the well-known hydatid in the brain of sheep, producing in that animal the disease known under the various names of staggers, turn-sick, goggles, rotatory disease, &c. How this hydatid excites these movements when it destroys certain parts of the brain, is now explained by the experiments previously noticed. Dr Romberg has collected a number of very interesting cases of vertiginous movements in the human subject.—On this subject, in addition to Romberg's work, the reader may consult a paper by Dr Paget, "On Morbid Rhythmic Movements," in the "Edin. Med. and Surg. Jour.," 1847, vol. lxxvii; and the

remarks of Dr Carpenter (in criticism of some of Magendie's conclusions) on the Cerebellum and its Functions in his "Human Physiology."

VERTUE, George, distinguished as an English engraver and antiquary, was born in London in the year 1684, of poor but respectable parents. At the age of 13, he was set to study under an eminent French engraver there; subsequently, he became a pupil of Michael Vandergrucht, with whom he remained seven years, and in 1709, he commenced business for himself. He was generously befriended by Sir Godfrey Kneller, the great portrait-painter of the day, who did much to procure him employment. His talent soon made itself recognised; and his eminent success in an engraved portrait of Archbishop Tillotson, for which he received a commission from Lord Somers, at once placed him in the very front rank of his profession. In 1711, on the institution of the Academy of Painting, with his friend Sir Godfrey Kneller as president, he enrolled himself as a member; but his contributions were few and unimportant. In his own more special department, he wrought through life assiduously, confining himself for the most part to reproductions of the portraits of Kneller, Richardson, and one or two others of the more eminent painters of the day. On the accession of George I., he issued a large engraved head of that monarch, which had an immense run, much increasing his reputation with the public. Himself, from an early period, devoted to antiquarian research, which from time to time he prosecuted in journeys hither and thither throughout England, he was appointed, in 1717, Engraver to the Society of Antiquaries, in which capacity he worked up to the time of his death, which occurred on 24th July 1756. He lies buried in the cloisters of Westminster Abbey. In addition to his eminence in his art, he was a man of considerable general accomplishment; an adept in drawing and music, and with a competent knowledge of the French, Dutch, and Italian languages. He projected a "History of the Arts in England," and had accumulated masses of material for it. At his death, his manuscripts were bought by Walpole, who made free use of them in his "Anecdotes of Painting in England." In a supplementary volume of that work, entitled "A Catalogue of Engravers who have been born or resided in England," a full list of his works is given, with some interesting notices of his character, the genuine unassuming worth of which is indicated in an unaffected expression of respect, of rather more than usual significance, as coming from the caustic and supercilious Walpole.

VERTUMNUS. See **POMONA**.

VERVAIN (*Verbena*), a genus of plants of the natural order *Verbenaceæ*, with a 5-lobed calyx, one division a little shorter than the rest, the limb of the corolla irregularly 5-lobed, the stamens (4 or 2) included within the corolla, the fruit a 4-seeded utricle, which soon breaks, so that the ripe fruit consists of four adherent achenia. The species are herbaceous plants and small shrubs, with undivided, trifid, or multifid leaves, natives chiefly of the warmer temperate parts of the world. The Common V. (*V. officinalis*), a perennial plant, with erect somewhat hispid stem, rough lanceolate inciso-serrate or trifid and laciniate leaves, and filiform spikes of pale lilac flowers, is a native of Britain and of most of the temperate countries of the world. It is a common ornament of flower-borders, continuing to blossom all summer. It had at one time a very high reputation as a medicinal plant, but its virtues are now regarded as imaginary. It has also been connected with some of the superstitious rites of different nations, as of the Greeks and Romans, the ancient Persians, and the British Druids.—A number of species of V., chiefly American and East Indian, are occasionally cultivated for the beauty of their flowers.

VERVELS, or **Varvels**, small rings attached to the ends of the jesses of a hawk, through which the leash is passed that fastens the hawk to its block. They occur as a heraldic charge.

VERVICK, or **Wervicq**, a town of Belgium, in the province of West Flanders, near the French frontier, on the Lys, 8 miles south-east of Ypres. Pop. (1870) about 6800.

VERVIERS, a prosperous manufacturing town of Belgium, in the province of Liège, most picturesquely situated on the river Vesdre, 15 miles east-south-east of Liège, on the Brussels and Cologne Railway. It is of recent growth, and being con-

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Vesicants

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posed wholly of workshops and of the dwellings of the manufacturers and their workmen, there are no remarkable objects of attraction. V. is the great centre of second-rate cloth-manufactures in Belgium. In and around the town, there are 69 cloth-mills, employing 40,000 hands and 155 steam-engines. The exports of cloth to Switzerland, Italy, and America are valued at £1,000,000 a year; and the goods, which are chiefly coarse woollens, are said to be better and cheaper than those of either France or England. The waters of the Vesdre possess qualities which render them admirably fitted for dyeing. Pop. (1873) 38,876.

VESALIUS, Andrew, the celebrated anatomist, was a native of Brussels, where he was born in 1514. He studied classics at Louvain, and anatomy and medicine first at Cologne, then at Montpeiller, and finally at Paris, where his preceptors were Gunther Sylvius and Fernelius. So keen was his love of dissection, that in order to procure subjects (at that time no easy matter), he ran considerable risks at the hands of the municipal authorities. Driven from Paris by the outbreak of war between Francis I. and Charles V., he returned to the Low Countries, where he served as physician and surgeon in the Imperial army from 1535 to 1537. In 1539 he went, by invitation to Pavia, where he taught anatomy till 1543. From Pavia he went again as a lecturer in anatomy, to Bologna and Pisa; and in 1544 was made physician-in-chief to Charles V. at Madrid, where he continued mainly to reside. He was now at the zenith of his prosperity, when an accident befel him which brought his career to a premature and disastrous close. A Spanish gentleman died in 1564, and permission to dissect the body was granted by his relatives to Vesalius. Life, however, was ascertained to be not quite extinct when V. began the operation, the heart being found still palpitating. The family of the deceased, with inconsiderate vindictiveness, arraigned V. before the Inquisition, by which tribunal some terrible sentence would have been passed upon him, but for the interposition of Philip II., who procured for the unfortunate anatomist the milder penalty of an injunction to make a pilgrimage to the Holy Land. V., accordingly, in the train of the Venetian General Malatesta, proceeded to Cyprus, and thence to Jerusalem. While sojourning in that city, he was invited to occupy the chair of Anatomy, just vacated in Padua by Fallopius. It is supposed that, in compliance with this invitation, he embarked for Europe; but the ship in which he sailed was wrecked on the shore of Zante. Hunger and misery of mind proved too much for him, and he died in a village of that island in 1564.

V. was one of those men of science who contributed to disenchant the minds of his contemporaries from their servile belief in the ancients. Galen was then to anatomy what Aristotle was to logical method; and V. assailed his authority by independent researches into nature. His first great publication was a series of anatomical tables entitled "*Suorum Librorum de Corporis Humani Anatome Epitome*" (Basel, 1542, fol.). The plates, from drawings by the best masters, and engraved on wood, were nearly all re-incorporated in his great work "*De Corporis Humani Fabrica Libri Septem*" (Basel, 1543). Great value is placed on the earliest impressions of these plates, the explanations of which, however, were revised by V. in his second (Basel) edition in 1555. He published in 1546 his severe attack on the errors of Galen's anatomy, the well-known "*De Radicis Chinæ seu Epistola*." The cause of Galen was then espoused by Galen's disciple, Fallopius, to whom V. replied in his trenchant "*Anatomicarum Gabriellis Fallopi Observationum Examen*" (1561). After his death, a work entitled "*Chirurgia Magna*," published under his name, but really a compilation from the ancient anatomists, was edited by his disciple Borgarncel. The great edition of V.'s works appeared with fine plates at Leyden in 1725. 2 vols. fol., under the superintendence of Boerhaave and Albinus.

VE'SICANTS, or Blistering Agents, are substances which, if kept in contact for some time with the surface of the body, excite such irritation as to cause the effusion of serum from the true skin, leading to the separation and elevation of the cuticle, and the formation of a vesicle or blister. They are employed in the practice of medicine for the purpose of relieving or removing the diseased condition of some internal part, by producing a determination of blood from the interior to the surface over the seat of the affection. They likewise are of great value from their action as general stimulants to the system, and as such are often used with great benefit in the advanced stages of low continued fever. Moreover, they are not unfrequently em-

ployed for the direct purpose of withdrawing serum from the vascular system, and with this view they are prescribed with advantage in cases of sudden effusion into the pericardium or the pleura. Blisters used with this object should be of large size, and should be kept in contact with the skin sufficiently long to produce their full effect (twenty-four hours being in some persons necessary for that purpose). Lastly, vesicants are occasionally applied to the surface of the body, for the purpose of removing the cuticle, so as to permit the direct application of various medical agents (especially mercury and morphia) to the absorbing surface of the true skin. It must be recollected that in infancy and childhood, owing to the extreme readiness with which inflammation of the skin is then set up, these agents must be used with extreme caution.

To produce vesication, *cantharidine*—the active principle of *Cantharides*, or Spanish Flies—in one of its various forms is generally employed, although other substances, afterwards to be noticed, are occasionally used. Cantharidine is a white crystalline substance, which is extracted from the powdered insects by rectified spirit, and whose composition is represented by the formula $C_{10}H_8O_4$. It is a very active poison, and produces immediate inflammation of the skin whenever it comes in contact with it, is very volatile, even at ordinary temperatures, and is soluble not only in alcohol, but in chloroform, ether, strong acetic acid, and many oils. This substance is employed in the form of plaster (*Emplastrum Cantharidis* of the *Pharm. Brit.*), blistering fluid (of which there are several excellent forms, such as *Acetum Canth.*, *Ether Canth.*, and *Collodion Canth.*, none of which are in the *Pharm. Brit.*), and blistering tissue (of which there are several forms, known as *Tela vesicatoria*, *Charta ves.*, *Blistering Cloth*, &c., none of which are official). Although the fluids and tissues are the cleaner and neater preparations, the old-fashioned *Cantharides Plaster* is far the most commonly employed in general practice, and is, by many of the authorities in the profession (amongst whom we may name the late Professor Syme of Edinburgh, and Prof. Lister, now of London), considered as the most efficacious (its superiority being due to its slower and more prolonged action). In prescribing a blister, it is expedient to sketch the size and shape desired. Before applying it, the skin should be well washed with warm water. If the patient's skin is not easily acted upon, the part should be sponged with vinegar; while if it is very susceptible, and he is liable to stragury from the application of blisters, a piece of tissue-paper should be placed between the skin and the plaster. (In speaking of the plaster, which is a solid mass, we assume that it is spread on some fitting material, as wash-leather, soft brown paper, &c., the popular idea of a plaster always including the material on which it is spread.) In order to insure close contact with the skin, the blister should be gently warmed, carefully applied, so as to avoid creases, and kept in its place by a bandage. To produce their full action, blisters should remain from ten to twelve hours, and if on their removal after that time full vesication has not been produced, a hot bread-and-water poultice will often produce the desired effect. The raised cuticle should be punctured, to allow the escape of the serum (except in the case of children and persons of very irritable skin, when the vesications should be left unopened), and a dressing of simple ointment or spermaceti ointment on soft rag applied, and repeated in twenty-four hours afterwards; or the part may be at once covered with cotton-wool, which, until it gives off a bad smell, can remain till the skin is healed. The troublesome *tickling* which often follows the application of a blister, is best relieved by the application of a bread-and-water poultice, moistened with the dilute solution of acetate of lead, formerly known as *Goulard's Vegeto-mineral Water*. Dr. Nelligan, in his highly practical work "*On Medicines*," speaks so strongly of *Collodium Vesicans* as a blistering agent, that although we have no personal experience of it, we shall, on his authority, briefly notice it. It is prepared, when required, by mixing together equal parts of collodion and cantharidal ether (obtained by digesting for three days one part of coarsely powdered cantharides in two parts of sulphuric ether, and expressing). It possesses the advan-

* We have not included the well-known *Papier d'Albespeyres*, which is often sold for this purpose, because it is not sufficiently powerful. It is useful for keeping open an already blistered surface.

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Vesta

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tage that its strength can be readily increased or diminished. "It is now much used for blistering," he observes, "owing to its cleanliness, its certainty, and the facility with which it may be applied in the neighborhood of joints, or to other parts which are difficult to blister by the ordinary method. It is applied with a camel-hair pencil; two scruples are sufficient to blister a surface as large as the palm of the hand. It is preferable to apply the quantity to be used twice, instead of at one time, on the place to be blistered."

When a blistering agent with very rapid action is required, as in the state of collapse in cholera, recourse may be had to the application of boiling or nearly boiling water* to a portion of the abdomen, the surrounding surface being protected by a wall of damp cloth; or in less urgent cases, as retrocedent gout shewing itself internally, an almost immediate blister may be produced by saturating a piece of lint of the size of the desired blister in the strong solution of ammonia, and applying it to the skin with moderate pressure. By the time that the ammonia has evaporated, the required result is usually obtained. When it is desired to keep up a discharge from a blistered surface (instead of healing it, as is most commonly required), or to produce a *perpetual blister*, we dress the raw surface with irritants of various kinds, such as savine ointment, *Papier d'Albespyres*, &c. At each fresh dressing, which in summer should take place twice a day, the part should be cleansed with warm water.

VESICA PISCIS (barbarous Lat. bladder fish, bladder evolved out of a fish), a term often, but not very correctly, used for the aureole or glory, of a pointed oval shape, formed by the intersection of two circles, which, in the religious symbolism of the early middle ages, is often represented encircling the whole body of the Saviour. This form is supposed to have been gradually evolved out of the figure of the fish, which is prominent in the symbolism of the early Christians on sarcophagi and elsewhere, and whose use arose out of an anagram on the initial letters of *Ἰησοῦ Χριστοῦ Θεοῦ Σωτῆρος*, Jesus Christ, son of God the Saviour. The oval form, generally designated by English antiquaries the *Vesica Piscis*, is much used in painted glass, and became from the 12th c. the almost invariable form of the seals of ecclesiastical persons and institutions.

VESOU, a small town in the east of France, capital of the dep. of Haute-Saône, stands in a fertile and picturesque country, overlooked by the mountain called the *Motte-de-Vesoul*, on the Durance, 236 miles east-south-east of Paris. The manufactures of the town are unimportant, but the environs are as fertile as they are beautiful; the slopes of the *Motte-de-Vesoul* are clad with vines; and a trade in grain, hay, and hides is carried on. Pop. (1876) 9097.

VESPASIANUS, Titus Flavius, Roman emperor, was a native of Rente, in the Sabine country, of humble origin. After serving with distinction in various military grades in Thrace, Britain, and Africa, he was sent by Nero to conduct the Jewish war. This appointment he owed to his recognised merits, for he was not a favorite with the emperor, whom he had offended by falling asleep during the recitation of one of his poetical compositions. He conducted the war with vigor, reduced Judæa, and finally laid siege to Jerusalem. At this time occurred the struggle for the imperial dignity between Otho and Vitellius, after the murder of Galba. The legions serving in the East were indignant that the empire should be disposed of at the will of the Prætorian Guards. Their own general was proclaimed emperor and quickly acknowledged as such by all the East, and, after the death of Vitellius, by Italy and all the provinces. Leaving his son Titus to prosecute the siege of Jerusalem, he repaired to Rome, where he was joyfully received, and immediately

* Strange and paradoxical as it may appear, "in the absence of other more suitable means, cold water may be used as efficiently as boiling water, and will not present so formidable an appearance to the patient. A piece of bibulous paper (common blotting-paper, for example) should be soaked in cold water, applied to the part to be vesicated, and covered with three or four folds of dry paper. A common smoothing-iron heated to 212° should now be pressed three or four times over all, and on removing the paper, the part will be found vesicated."—Neilgan, *op. cit.*, p. 825.

set about the work of restoring order. He kept his soldiers under firm discipline, improved the finances, co-operated cordially with the senate in the administration, and did much by his example to lessen the ill effects of the prodigality and luxury of his predecessors. An interesting biography of him has been written by Suetonius, and from the personal anecdotes there recorded, we are enabled to estimate clearly the character of the man. He was simple and unostentatious in his mode of life, too shrewd to listen to flattery, liked a joke, was good-humored, and easy of access. He is charged with being avaricious, and at times he certainly sought to obtain money by rather undignified ways; but though niggardly in personal expenditure, he was lavish in embellishing the city with public works, and a munificent patron of the arts and sciences. He is chargeable also with one or two acts of cruelty, but usually he bore provocation with great good temper. He died 79 A.D., in the 69th year of his age, after a reign of ten years.

VE'SPERS (Lat. *vespere*, in the evening), one of the canonical hours of the Breviary, called also anciently *Lucernarium*, from *lucerna*, a lamp. It is a service of very ancient use, being plainly referred to in the apostolical constitutions, and is noticeable as that one among the canonical hours which in the Roman Catholic Church continues to be regularly sung as one of the ordinary public services of parish churches, no less than in cathedrals where the entire of the hours are chanted. It resembles lauds, and consists of five psalms and antiphons, a lesson, a hymn with versicle and response, a canticle (the Magnificat), and a collect or prayer. The psalms sung at vespers are Ps. cix.—cxlvii., which are distributed over the several days of the week. The service of vespers has given occasion to some of the most brilliant efforts of modern musical composers. The Evening Prayer of the English Prayer-book corresponds partly with the vespers, partly with the compline (*completorium*) of the Roman Breviary.

VESPUCCI, AMERIGO. See **AMERIGO VESPUCCI**.

VE'STA, VE'STALS. Vesta, an ancient Latin divinity whose worship was the embodiment of an idea, deeply rooted in the Latin, and particularly, in the Roman mind—viz., that the state was one great family. As the Lares were the tutelary guardians of the individual household, so the Penates and Vesta watched over the welfare of the state. The Greek *Hestia* (hearth) is a kindred conception; and if the word is the same, it may be conjectured that the worship of the chaste divinity that presided over domestic life goes back to a period when the Greeks and Latins were still an undivided people. The state, we have said, was regarded by the Latins as one great family, so each community had its public altar to Vesta, the central one for the whole Latin people being at Lavinium, about 20 miles from Rome, on the Appian Way, where the Roman consuls and other officers offered sacrifices on entering upon their offices. The common hearth of the Greeks was at Delphi. There was also a temple of Vesta at Rome, which stood in the Forum, near the temple of the Penates (see **LARES**, &c.), between the Palatine and Capitoline hills; it was open during the day, and closed during the night. On the first of March each year, the sacred fire was renewed; on the 9th June, the *Vestalia* were held in honor of the goddess; and on the 15th of that month, the temple was cleared out, and the dirt carried into a narrow lane (*anagiportus*) behind the temple, which was locked by a gate, that none might enter.

The goddess herself was a virgin, and her fire was carefully tended night and day by the *Vestal virgins*. The number of these priestesses was originally four, but two were subsequently added, increasing the number to six. At first, they were chosen by the kings; but after their expulsion, by the Pontifex Maximus, who, when a vacancy had to be filled up, selected twenty damsels between the ages of six and ten years, from among whom one was chosen by lot. A father could offer his daughter for the office, if he chose, but this seldom happened. The necessary qualifications for the office of Vestal were, that the maiden should be the daughter of free-born parents, then alive and resident in Italy, and engaged in no dishonorable occupation; that she herself should not be younger than six, nor older than ten years, and free from any physical defect. The period during which the priestess was bound to the service of Vesta was thirty years, the first ten being occupied with learning her duties, the next in performing them, and the last in teaching them to others. When

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Vestry

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she entered upon her office, the Vestal took upon herself a solemn vow of chastity for the thirty years of her service, the dreadful punishment of a violation of which was, that she should be buried alive in a subterranean vault, near the Colline Gate, to which she was carried on a bier, as if dead, and where she found a light, with a scanty supply of bread, water, milk, and oil. The chief duty of the virgin priestesses was to keep the fire on the altar of the goddess ever burning; they had also to present offerings to Vesta, sprinkle the temple every morning with water drawn from the Egerian well, and guard the sacred relics, which were a pledge granted by fate for the permanency of the Roman sway. As the extinction of the sacred fire was looked upon as emblematic of the extinction of the state, the Vestal who, by neglect of duty, allowed this to happen, was severely punished, the penalty being, that she should be stripped and scourged by the pontifex in the dark; the fire was again rekindled by the friction of two pieces of wood from a "lucky tree."

As a compensation for the strictness of the lives which they had to lead, the Vestals had many privileges bestowed upon them: among others, they were entirely freed from paternal authority: could make a will, and give evidence without taking an oath; had a seat assigned them in the best part of the theatre; were held in the greatest honor, and done homage to by the highest officers of the state; and even the plebs, in their most reckless moments, respected them. If, when out walking, their eye should chance to light upon a criminal, he was set free. At the expiration of her period of service, a Vestal, if she chose, could marry, although to do so was considered very unlucky, so that she generally ended her days in the service of the goddess.

VESTIBULUM, a porch or ante-room, from which a house or large apartment is entered.

VESTMENTS, Sacred, the peculiar habiliments worn by ministers of religion in the public discharge of their office, and sometimes in other sacred ministrations, even when privately performed. The use of a distinctive costume in public worship formed a part not only of the Jewish, but of almost all the ancient religions, and has been found in a greater or less degree in the religions of the new world. See Lipsius, "*De Monument. et Exemp. Polit.*," l. i. c. 8. The whole 28th chapter of Exodus is taken up with a description of the vestments of the high-priest; and the directions for those of the inferior functionaries are almost equally minute. Whether the same characteristic was carried into the early Christian worship, has been a subject of controversy; some writers being of opinion that the peculiar sacred costume which we find in use among Christian ministers from a very early period was not originally peculiar to the clergy, but was simply the ordinary costume of Rome and of the East in the first centuries, and only came to be a costume distinctive of sacred ministers, because by them it was retained unaltered, whereas in the every-day world the costume varied in fashion, in material, in color from year to year. There seems little room, however, for doubting, that from a very early time Christian ministers did employ some distinctive dress in public worship; and Catholic writers even find traces in the beginning of the 5th c. of the practice of blessing the vestments which were destined for the public services of the church. See Binterim, "*Denkwürdigkeiten*," IV. l. p. 198. From the 8th c. downward, the rituals of the West all contain formularies for the blessing of the several sacred vestments worn by bishops, priests, deacons, and lower clergy. The vestments used in the celebration of the mass by priests of the Roman Catholic Church are six in number—viz., (1) the amice, a square piece of linen, which is worn upon the shoulders, and in some of the religious orders, over the head, which latter, indeed, appears to have been the ancient mode of wearing it; (2) the alb, a long, loose-sleeved, linen gown, sometimes richly embroidered or "apparelled" at the lower border; (3) the cincture, a linen cord tied around the waist, and confining the folds of the alb; (4) the maniple, a narrow strip of embroidered silk, worn pendent from the arm; (5) the stole, a long narrow scarf, similarly embroidered, and worn by priests around the neck, the ends being crossed over the breast or pendent in front, and by deacons, transversely over one shoulder; (6) the chasuble, a loose flowing vestment, open at the sides, having a hole in the centre, through which the head passes, and falling down over the breast and back to some distance below the knees. Most of these vestments have been already briefly described. The three last named are always of the

same material and color; but this color, which appears primitively to have been in all cases white, now, and for many centuries, varies according to seasons and festivals, five different colors being employed in the cycle of ecclesiastical services—viz., white, red, green, violet, and black. Cloth of gold, however, may be substituted for any of these, except the last. A cap, called *biretum*, is worn in approaching the altar, but is laid aside during mass. Besides these vestments, which are worn by priests during the mass, bishops in the same service use also two inner vestments, of nearly the same form as the chasuble, called "dalmatic" and "tunic," as also embroidered gloves and shoes, or buskins, together with the distinctive episcopal ornaments—the pectoral cross, the mitre, the pastoral staff, or, if archbishops, the crozier, and ring. Archbishops celebrating mass also wear the Pallium (q. v.). Deacons, at the same service, wear a robe, called dalmatic; and sub-deacons, a tunic. The sub-deacon is not privileged to wear the stole. In other public services, priests and bishops wear a large flowing cloak, called cope (Lat. *piuviale*), with a pendent cape or hood, called orfrey. In the administration of the other sacraments, and also in administering communion, priests wear the surplice (which is but a short alb) with the stole. The vestments of the Greek priests differ considerably in their general character and effect from those of the Latin clergy, but the several portions of the costume are substantially the same as those of the Latin costume already described. The *stocharton*, the *zond*, the *orarton*, the *epimanikia*, and the *phelorian*, correspond respectively with the alb, cincture, stole, maniple, and chasuble. Greek bishops wear the *omophorion*, which corresponds with the later pallium. The *phelorian*, however, is so ample in its folds as to resemble the Latin cope rather than the chasuble; and the general effect of the Greek vestments, which may be said to resemble in all particulars that of the other Eastern rites, is much more picturesque.

The natural effect of the religious changes of the 16th c. was to put aside the costume at the same time and on the same grounds with the ceremonies of the existing worship. This was done, however, by the different churches of the Reformers in very various degrees. The Calvinistic worship may be said to have dispensed with vestments altogether. The Lutherans generally retained with the cassock the alb, and in some countries the chasuble. In the English Church, a variety of practice has existed. The disputes about the use of the Surplice (q. v.) have been already described. As to the rest of the costume, the first Prayer-book retained the Roman vestments with little change; and as, by a remarkable accident, the rubric of this Prayer-book has never been formally repealed, a so-called ritualistic movement in the English Church has re-introduced in some places almost every detail of the Roman costume in the communion and other services, an innovation which has in many instances been vigorously resisted.

VESTRY, in English parishes, is a meeting of the inhabitants of the parish assembled to deliberate on some matter which they have a right to decide (see PARISH). The vestry is the regular organ through which the parish speaks; and in numerous matters relating to church-rates, highways, baths and wash-houses, and other sanitary matters, it has important functions to discharge, and is a conspicuous feature of parochial management. A statute was passed in 1818 to regulate the mode of procedure. No vestry, or meeting of inhabitants in vestry, shall be held until public notice of the place and hour of meeting be given, as well as of the special purpose of such meeting. This notice is required to be given by publishing it on some Sunday before the celebration of divine service, by affixing a written or printed copy on the principal door of the parish church or chapel. Such notice is to be previously signed by a churchwarden of the church or chapel, or by the rector, vicar, or curate of the parish. These meetings were formerly held in the vestry-room of the church, hence the name given to the meeting itself. In large parishes, the vestry-room of the church was found too small; and wherever the population exceeds 2000, the vestry may apply to the Poor-law Board to have some room, or other place of meeting than the church, built or hired for the purpose of the vestry-meetings. The minister of the parish—that is to say, the rector, vicar, or perpetual curate—if he be present, is entitled to be the chairman; but if he be not present, then the meeting may nominate one of the inhabitants to be chairman. The chairman has the power of adjourning the meeting, but he must exercise such power prudently, and so as to facilitate the business. None but persons rated to the relief of the poor can vote in a vestry; and though

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formerly none could vote unless actually residing in the parish, this is no longer necessary, provided the person is rated to the poor of the parish. The number of votes depends on the rental or value of the occupation, one vote being allowed for each £25 of value, or rental, provided that no person shall have more than six votes. In case of joint-occupiers, each votes according to his own share of the joint-value. One of the incidents of holding a vestry is, that any vestryman, after a show of hands is taken, may demand a poll, and if the poll be refused, the resolution come to is void. The law has surrounded this parochial right to a poll with jealous care; and if there is not fair-play given, and ample notice and time for all the inhabitants entitled to vote to come and give their vote, the whole proceedings are void. It is the duty of the churchwardens and overseers to keep a book in which to enter the minutes of the vestry. The vestry appoints annually churchwardens and highway surveyors. While church-rates were compulsory, a church-rate could only be made by a vestry; and if the majority chose to make none, then no rate was possible. The vestry also deliberates and resolves as to stopping up, diverting, or turning highways; whether the owners of small tenements ought to be excused from paying poor-rates; whether baths and wash-houses, parish libraries, &c., shall be adopted. In large parishes, a vestry-clerk is usually appointed, and paid out of the poor-rate; and in such case, he is appointed by the vestry. His duty is to give notices of all vestry-meetings; to summon the churchwardens and overseers; to keep the minutes, accounts, and vestry-books; to make out the church-rate; recover arrears of rates; make out lists of persons qualified to act as jurymen; and to give notices for claims to vote for members of parliament. Some parishes are governed by a select vestry, which means a small part of the chief inhabitants appointed by justices of the peace under a statute, and their duty consists of relieving the poor, and they supersede the common vestry of the parish.

VESUVIAN, or *Idocrase*, a mineral, allied to garnet, and sometimes called *Pyramidal Garnet*. It is found in volcanic and in primitive rocks. It is frequent in masses ejected from *Vesuvius*, whence its name. The hardness is about equal to that of quartz. The colors are various—yellow, green, brown, almost black, rarely azure. *V.* is composed of silica, alumina, and lime, in somewhat varying, but not very unequal proportions, with a little oxide of iron and oxide of manganese. It is employed as an ornamental stone, but is not very highly valued. The green-colored varieties are known as *Volcanic Chrysobite*, and the brown as *Volcanic Hyacinth*.

VESUVIUS, a well-known volcano, is situated near the east shore of the Bay of Naples, about ten miles from the city of that name. It is a solitary mountain, rising majestically from the plain of Campania, having at the base a circumference of about 50 miles, and dividing, at a certain height, into two summits, *Somma* and *Vesuvius Proper*. The height of the mountain and form of its apex are subject to frequent changes by eruptions. It is estimated to be at present nearly 4000 feet high. In the single eruption of 1892, it lost 800 feet, nearly all of which has been restored by subsequent eruptions. Before that event, the summit was a rough and rocky plain, covered with blocks of lava and scorise, and rent by numerous fissures, from which clouds of smoke were given out. But it was then altered to a vast elliptical chasm, three miles in circumference, three-quarters of a mile at the greatest diameter, and about 2000 feet deep.

The first recorded eruption took place in the year 79 A.D. Warnings had been given 16 years before by a great earthquake, which shattered the cities of *Herculaneum* and *Pompeii*, and the earth was frequently shaken by slight shocks until August of the year 79, when they became more numerous and violent. Previous to this, *V.* was not suspected to be a volcano. Its sides were covered with famous vines, and its ancient crater, partly filled with water, formed the stronghold of the rebel chief, *Spartacus*. The morning of the 24th August brought comparative repose; but in the course of the day, a huge black cloud rose from the mountain, from which stones, ashes, and pumice were poured down on all the region around. The elder *Pliny*, who commanded the Roman fleet at *Misenum*, sailed to the help of the distracted inhabitants: he landed near the base of the mountain, was enveloped in sulphurous vapor, and was suffocated. The younger *Pliny* gives a graphic account of the eruption in two letters to *Tacitus*, which are well known. No lava was ejected on this occasion, nor indeed in any eruption in historic times up to the year 1084.

Pompeii was buried under a thickness of 20 feet of loose ashes, and remained unknown till about a century ago. A torrent of mud spread over Herculaneum, which, by additions from subsequent repeated eruptions, now forms a thickness of 80 or 100 feet. Since this first famous eruption, V. has been an active volcano, and has been frequently but irregularly in eruption, about 60 great and numerous smaller ones having taken place. In 472, the eruption was so great that the ashes fell even at Constantinople, and caused great alarm there. The summit known as Monte Nuovo was, in 1538, forced up in two days to the height of 413 feet, and with a circumference of 8000 feet. In 1631, the villages at the foot of the mountain were covered with lava, and torrents of boiling water were sent forth. Since that described by Pliny, one of the most famous is the eruption of 1779, of which Sir William Hamilton, then British minister at Naples, gives an interesting account. In the spring of that year, it began to pour forth lava; this was succeeded by rumbling noises and puffs of smoke; then jets of red-hot stones and ashes made their appearance, and increased in number and intensity, until the eruption arrived at its climax between the 5th and 10th of August. Then enormous volumes of white clouds rose from the crater to a height four times that of the mountain, and lava poured from the crater in torrents down the sides of the cone. This was followed by columns of fire, which rose on some occasions to three times the height of V., or more than two miles. In the midst of all this, showers of stones, scoriae, and ashes were thrown out to a great height. One mass of rock ejected was 108 feet in circumference, and 17 feet high. A more terrible eruption took place 18 years later, by which the greater part of the town of Torre del Greco was destroyed. The violent eruption of 1822 has already been alluded to. A remarkable eruption occurred in May 1855. In 1865 began a series of eruptions, which have been repeated at intervals since. For a full account of the fearful outbreak of April 1872, we are indebted to Palmieri, director of the Meteorological Observatory on Mount Contarone, a part of V., who with great courage remained in the observatory while it seemed threatened with destruction.

VEŠZPRIM (Ger. *Weiszbrunn*), a town in the west of Hungary, beautifully situated among vineyards to the north of Lake Balaton, and 70 miles south-west of Pesth. It is a bishop's see, and contains a handsome episcopal palace, a fine cathedral, a Piarist college, gymnasium, and an institution for decayed or disabled priests. Cloth and flannel weaving, silk-spinning, the cultivation of wine, fruits, and tobacco, are the principal industries; but coal-mining, iron-works, large cattle-markets, and general trade, are carried on. The town has been on several occasions in the possession of the Turks; and an interesting memorial of them is a slender minaret, which rises from an old Gothic tower, and which now serves as a watch-tower against fire. Pop. (1869) 12,002.

VETCH (*Vieta*), a genus of plants of the natural order of *Leguminosae*, sub-order *Papilionaceae*, having a tuft of hairs on the style beneath the stigma, nine stamens united, and one free. To this genus the *Bean* (q. v.) is generally referred. The species, however, are mostly climbing plants, annuals, with pinnate leaves ending in tendrils, and with no terminal leaflet. A number of species are natives of Britain. The Common V. (*V. sativa*), sometimes called by agriculturists **TARE**, frequent in cultivated ground in Britain and throughout Europe, and itself much cultivated as green food for cattle, has rather large purple, blue, or red flowers in pairs, axillary and almost sessile. In cultivation, it varies considerably both in size and other particulars, as in the breadth of the leaflets, the number of them in a leaf, &c. Oats are generally sown along with it, to afford it a little support, and thus prevent its rotting in wet weather.—*V. Cracca* and *V. septium* are very common British species, the former with many-flowered stalks, bearing beautiful bluish-purple flowers, being one of our most beautiful climbing plants, and a chief ornament of trees, hedges, and bushy places in the latter part of summer. These and other species, natives of Britain or of different parts of Europe and the north of Asia, have been either occasionally cultivated as food for cattle or recommended for cultivation, and generally agree with the Common V. both in their qualities and in the mode of cultivation which they require. *V. diennis* and *V. Narbonneensis* are amongst those chiefly cultivated in some parts of Europe. The species of V. are very numerous, chiefly in the temperate parts of the northern hemisphere.

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VETCH, Bitter. See OROBUS.

VE'TCHLING. See LATREYUS.

VE'TERAN CORPS are among the Military Reserves of all nations. They consist of old soldiers past the prime of active manhood, and incapable of taking the field. Their discipline and steadiness, however, admirably fit them for garrisons or fortresses, and for the instruction of young troops. The Veteran Bataillons did good service during the French war as home guards, releasing the active troops for foreign service. At present, our veteran troops consist of about 12,000 Enrolled Pensioners (see PENSIONERS). But from the short periods during which men serve as soldiers, and the number of officers who quit the army on reaching the rank of captain, it is almost certain that very large veteran corps could be formed from civil life in any case of national emergency.

VE'TERINARY MEDICINE (Lat. *veterina*, beasts of burden; probably from *veterina*, from *veto*, to carry) embraces the medical management of the domestic animals, and appears to have been studied by the ancient Egyptians as well as by the Greeks and Romans. Hippocrates contributed a treatise on equine disorders; Columella and Vegetius (the latter of whom flourished about 300 A.D.) have left several curious veterinary works. Until after the middle of the 18th c., there were, however, no schools for the teaching of veterinary science or art. The several works published in France, Italy, and elsewhere were not of great value. In this country, Blundeville and Gervase Markham, who lived in the reign of Elizabeth, published volumes on farriery; Snape, farrier to Charles II., produced an anatomical treatise on the horse; Mr Gibson, previously a surgeon in a cavalry regiment, paid much attention to the disorders of animals, and about the middle of last century, published "The Farrier's Guide," which continued for many years the best authority on the subject. The treatment of sick horses remained, however, in the hands of the riding-master, the groom, or the shoeing-smith or farrier (from *ferrum*, iron); whilst the doctoring of the other domestic animals devolved upon the goatherd, shepherd, or cowleech.

Veterinary medicine, as a scientific art, takes date from 1761, when the first veterinary college was established at Lyon with royal patronage, under the able teaching of Bourgelat. Five years later, the flourishing school of Alfort, near Paris, was founded. In February 1791, the London College was organised, Charles Vial de St Bel being appointed principal, with Delabore Blaine as assistant-professor. St Bel died in 1793, and was succeeded by Mr Coleman, who, during many years, zealously improved the position and teaching of the college. In Scotland, lectures on veterinary medicine were first given by Mr Dick in 1819. Under the auspices of the Highland and Agricultural Society, and Senator Academicians, Mr Dick, in 1823, began his systematic teaching of veterinary surgery. Soon afterwards, he erected the college buildings in Clyde Street, Edinburgh, with hospital for sick animals; he collected a valuable museum; extended the curriculum of study; and engaged efficient assistants, among whom were John Barlow and Dr George Wilson, to instruct his pupils in anatomy and physiology, chemistry and materia medica, cattle-practice and histology. At his death in April 1866, Mr Dick bequeathed to the city of Edinburgh the college which he had founded, and his entire fortune, to be devoted to the teaching and improvement of veterinary medicine. For many years, upwards of 80 professional pupils, with a number of agricultural and amateur students, have annually attended the classes at the Edinburgh Veterinary College. About 150 are enrolled at the Camden Town College, London. In 1867, Mr John Gamgee established the New Veterinary College in Edinburgh, which existed till 1865, when Mr Gamgee went to London. The New Veterinary College, Gayfield House, Edinburgh, was established by Principal Williams, and recognised by royal sign manual in 1873. Since 1861, a veterinary school has been conducted in Glasgow by Mr James Macall. An attendance at one or other of these colleges, during three sessions of six months each, and two sessions of two months, is required before a pupil can present himself to be examined for his degree. At the best continental schools four years' study is usually necessary. The fees for the whole curriculum at the different educational establishments are about 86 guineas. At all the colleges—at London by the College of Preceptors; at Edinburgh by the rector of the Royal High School and mathematical

master; at Glasgow by the principal of the college—a preliminary examination is now required.

In 1844, a royal charter was granted, under which veterinary surgeons (graduates of either the London or Edinburgh College) became a corporate body, entitled "The Royal College of Veterinary Surgeons," with authority to appoint examining boards, and grant diplomas or licenses to practice. In 1876, a supplementary charter was obtained, empowering the Royal College of Veterinary Surgeons to grant the higher title of Fellow, without examination, to the most eminent members of the profession who had been fifteen years in practice, and to appoint a board to examine candidates for the fellowship degree, each candidate to have been five years in practice. Nearly 2000 persons now hold these diplomas, which cost £10, 10s., and constitute the holder a member of the Royal College. For nearly fifty years, the Highland and Agricultural Society of Scotland have annually appointed an examining board, consisting of medical men and skilled veterinarians; and at the cost of £2, 2s., have granted to pupils who have studied for two sessions at the Edinburgh Veterinary College, a certificate, which has been fully recognised as a guarantee of professional ability by the public, and by the authorities at the Horse Guards and India Office. The profession having obtained the supplementary charter by which many grievances have been removed, the Highland and Agricultural Society and the Royal College of Veterinary Surgeons are now on the point of completing an arrangement, the result of which will be the abolition of the society's examination, and the admission of its present certificate-holders as members of the Royal College without examination. In many English towns and districts, there are veterinary practices worth from £500 to £1000 a year; whilst in London, Manchester, and elsewhere, the receipts of a few exceed that amount.

The literature of veterinary medicine is rapidly widening. Mr Percivall and Messrs Gamgee and Law, and the late Professor Strangeways, have published textbooks on anatomy. The chief reliable authorities on diseases consist of Mr Dick's excellent little manual of veterinary science; Percivall's "Hippopathology," in 8 vols.; Mr Gamgee's "Domestic Animals in Health and Disease;" F. Dunn's "Veterinary Medicine, their Actions and Uses, with an Appendix on Diseases of Animals;" Tison's "Pharmacy." Late important contributions are Professor Williams's "Principles and Practice of Veterinary Surgery" (Edinburgh, 1872); and "Principles and Practice of Veterinary Medicine" (Edinburgh, 1874), which have now reached their third and second editions. Mr Fleming, V. S., R. E., has translated M. Chaveau's elaborate treatise on the "Anatomy of the Domesticated Animals" (1873); has published "Sanitary Science and Police," 2 vols.; "Rabies and Hydrophobia;" "Animal Plagues;" "Veterinary Obstetrics;" and founded "The Veterinary Journal." The "Veterinarian," a monthly periodical, has been published for many years.

VETERINARY SURGEON (Army), an officer of a cavalry regiment, or in the artillery, who is charged with the supervision of the horses, and with their cure, if in need of medical aid. A veterinary surgeon is required to produce proper testimonials of qualification, and to pass an examination. On appointment, he receives 10s. a day, and ranks as lieutenant. By service, his pay rises to £1, 8s. a day, and his relative rank to that of major. After 25 years' service, he becomes entitled to retire on half-pay.

VETIVER, or Cuscuta, the dried roots of an East Indian grass (*Andropogon muricatus*), which has a very agreeable and persistent odor, something like sandal-wood. It is much prized in India and other parts of the world, and is used to perfume linen, &c. Baskets, fans, and mats are made of it in India; it is remarkable for giving out its perfume for many years, and it is strongest when moistened.

VETO, in Politics, the power which one branch of the legislature of a country may have to negative the resolutions of another branch. In the United Kingdom, the power of the crown in the act of legislation is confined to a veto—a right of rejecting, and not resolving. The crown cannot of itself make any alterations in the existing law, but may refuse to sanction alterations suggested and consented to by the two Houses of parliament. The necessity for such refusal is generally obviated by an observance of the constitutional principle, that the will of the sovereign is that of the responsible ministers of the crown, who only continue in office so long as they have the confidence of parliament. The royal veto is reserved for extreme

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emergencies; the last instance in which it was exercised was in 1707, when Queen Anne refused her assent to a bill relating to the militia in Scotland. The House of Lords will generally support the prerogative of the crown by rejecting a measure repugnant to the sovereign; and a knowledge of this may enable the ministry to defeat it in the House of Commons—a result which the constitutional influence of the crown and the House of Lords in the Lower House may assist in producing, so as to avoid a collision between the branches of the legislature. In bills of supply the power of the House of Lords amounts merely to a veto, as does that of the House of Commons in bills affecting the peerage.

In the United States of America, the President has a qualified right to veto all laws passed by Congress; but after that veto has been exercised, the bill which he has rejected may become law by being passed by two-thirds of each House of Congress. For the Polish *liberum veto*, see POLAND.

In the French constitution of 1791, it was resolved to have but a single house of legislature, on the principle that it was inconsistent with the idea of a legislature representing the national will that one part of it should have a veto on another, and the same view was adopted by the Convention of 1793. But the arbitrary and violent measures of that latter body induced a strong general conviction that a division of the legislative power, and a veto in some form, was essential to give stability to the government, and moderation to faction; and in the constitution of 1795, a Council of Ancients was introduced, with a power to veto the resolutions of the legislative body.

VETO ACT, in Scottish Ecclesiastical Law. See PATRONAGE; SCOTLAND, CHURCH OF.

VEUILLOT, Louis, French journalist and author, born in 1812, at Boynes en Gatinais (Loiret). The son of a small cooper, he was sent to a school near Paris, from which he was transferred in 1826 to a lawyer's office. He chose the profession of journalism, and filled several engagements on the provincial press, in the course of which his personalities involved him in various duels. He visited Rome in 1833, previous to which, he states, he was without much faith, either religious or political. He returned to Paris, however, a zealous adherent of the papacy, and, as editor of the "Univers," soon signalled himself as an aggressive and uncompromising champion of the church. In 1842, he accompanied Marshal Bugeaud to Africa as his secretary, and on his return was made Chief Secretary to the Ministry of the Interior. He again edited the "Univers" in 1848; but his polemical disquisitions brought upon him the censure of the Archbishop of Paris; and in 1853 the clergy of the diocese of Orleans were expressly forbidden by their bishop to read the "Univers," which, after the usual three warnings, was suppressed by the French government in 1861. It was afterwards replaced by the "Monde," in which V. discussed religious matters in a more temperate spirit. In 1863, he published a pamphlet, under the title of "Parfum de Rome," which was principally devoted to heaping coals of fire on the head of Cavour, and assailing the Abbé Passaglia with the bitterest oburgations. He prays, for instance, that "his robe may become a robe of fire," and that Heaven "may refuse him a single tear to temper his burning." In 1867, the "Univers" was revived. V., besides polemical pieces, has written novels, hymns, and a collection of articles under the title of "Mélanges Religieux, Historiques, et Littéraires" (1857). One of the most brilliant of his productions is "Les Odeurs de Paris" (1866). In 1868, a collection of extracts from his writings was published by the Abbé Charbonnell.

VEVAY (Ger. *Vivis*), a small town of Switzerland, in the canton of Vaud, remarkable for the beauty of its situation, on the north shore of the Lake of Geneva, 11 miles east of Lausanne. It stands at the mouth of the gorge of the Veveyse, where it opens upon the lake, and where the scenery of the banks is exceedingly beautiful. From the elevations about the town, the fine view to the east commands the gorge of the Rhone, backed by the magnificent rampart of the Alps of Valais. In the church of St Martin (date 1488), Ludlow, one of Charles I.'s judges, and Broughton, who read to him his sentence of death, are buried. The country in the vicinity, especially that between V. and Lausanne, is much occupied by vineyards and orchards, and the wines of the vicinity have some reputation. Pop. (1870) 7887.

VIADUCT, a structure for conveying a roadway across a valley or low level, being so called in distinction from an *Aqueduct* (q. v.), which is an erection of the same description for the conveyance of water over a hollow. It is in every respect similar to an extended bridge. The great extension of railways within recent years has rendered the use of viaducts much more common than formerly. These are of every kind of construction—of wood, iron, stone, and brick work (see **BRIDGE**, **TUBULAR BRIDGE**, **WOODEN BRIDGES**, &c.). A railway embankment is also a species of viaduct; but the term is limited to those structures which are more or less open, and rest upon piers. A very peculiar example is that over the Molne, near Nantes, in France. The piers are all perforated by a pointed arch, which intersects the main cylindrical arches, and forms a groined roof, similar to that of a Gothic cathedral. This viaduct consists of 15 arches, and is 548 feet in length, and is all built of fine granite.

VIA-MALA, a remarkable defile in the canton of Grisons, Switzerland, is a portion of the Hinterrheinthal (see **RHINE**) which lies between Thusis and Zillis. The sides of the cleft, which is about two miles in length, are immense walls of rock, almost parallel to each other, and so hard that the disintegrating influence of the elements appears not to have produced the slightest effect on them, each projection on one side corresponding to an indentation on the other, almost as perfectly as at the time they were separated. The walls have a maximum height of about 1600 feet, and at various parts of the defile are not more than ten yards apart at the top. Far beneath, the Hither Rhine, compressed till it appears to one above like a mere thread, rushes like an arrow through the gorge. The first part of this defile was long deemed quite inaccessible, and had received the name of the Lost Gulf (Fr. *Trou perdu*; Ger. *Verlorenes Loch*), but in the early part of this century, a magnificent road was constructed along the whole length of the defile, from 400 to 600 feet above the river, by blasting and cutting a "notch" in the side of the rock. The road is necessarily steep and narrow, crosses from side to side of the defile by three bridges, and is protected now by a canopy of rock overhead, and again by a wooden roofing, from falling stones and trees. So narrow is the crevasse in some places, that fallen trunks and stones are often wedged in between its sides at a considerable distance above the ordinary water-level; and on the occasion of the great flood of 1834, the river, which is generally 400 feet below the second bridge, rose to within a few feet of it, and at the same time carried off the upper bridge.

VIA-NNA, a fortified city and seaport in the north of Portugal, in the province of Minho, stands at the mouth of the Lima, 40 miles north of Oporto. It is handsome and clean, with a tolerable harbor, which admits vessels of 150 tons burden; and it carries on considerable trade with Newfoundland in salt-fish. Pop. about 9000.

VIAREGGIO, a town of Central Italy, in the province of Lucca, close to the shore of the Mediterranean, 30 miles south-east of Spezia. It is modern, stands in a delightful plain, and has wide straight streets. At the beginning of the present century, it consisted of only a few huts; but its climate, which is healthy and delightful all the year round, and its fine situation, have induced many rich families to settle here, and it is yearly increasing in extent. It is much frequented for bathing in summer. The vicinity is productive in olives, grapes, &c. Pop. about 10,000.

VIA'TICUM (Lat. *viaticum*, money allowed for a journey), the word applied in the ancient as well as modern ecclesiastical terminology to the communion administered to dying persons, which, in the case of the great journey to eternity, is thus quaintly likened to the money-provision made for a journey upon earth. This special ministraton of the Eucharist to the dying is very ancient (see **LORD'S SUPPER**); it was the one exceptional case in which, during the times of rigorous canonical penance, the penitents were admitted to the communion before the completion of the appointed cycle of penance. By the modern practice of the Roman Church, it is permitted to the sick, to whom the Eucharist is administered in the form of the viaticum, to receive it, although not having fasted (as is required in all other cases) from the midnight previous. The viaticum may be given frequently during the

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same sickness, at intervals anciently of ten or seven days, but, by the modern practice even daily, should it be earnestly desired by the sick person. The priest is ordered to bring the sacred elements from the church to the dying person at any hour, whether by day or by night, when he may be called on for this last service of religion.—Protestants reject the very idea of a *viaticum*, and regard the administration of the Lord's Supper in that character as superstitious.

VIA'TKA, a government of the east of European Russia, bounded on the e. by the governments of Perm and Orenburg, and on the s. by that of Kazan. Area, 59,000 sq. m.; pop. (1870) 2,406,024. The surface consists for the most part of marshes and sandy plains, varied here and there by hills. The soil, fertile only in the southern districts, is mostly a mixture of sand and clay. In the south, agriculture is effectively carried on, wheat, rye, barley, and oats being produced in abundance, as well as flax and hemp, which supply materials for the linen manufactures. The principal rivers are the Viatka and Kama (navigable throughout the whole year), and their affluents. Owing to the number of unnavigable streams, and to the well-regulated land-communications, the traffic of the government is successfully carried on. Horses of a fine breed are reared, but the principal source of the wealth of V. is its timber. Iron-works, distilleries, tanneries, and glass and cotton factories, are in operation.

VIA'TKA, a town of Russia, capital of the government of the same name, on the river Viatka, 280 miles north-east of Nijul-Novgorod. It was founded by the inhabitants of Novgorod, and was annexed to the Muscovite dukedom in 1499. The chief branches of industry are the preparation of skins and the manufacture of tallow and wax-candles. Corn is exported annually to the amount of 800,000 roubles (£46,875). Pop. (1867) 19,898.

VIA'ZMA, a town of Great Russia, in the government of Smolensk, and 100 miles east-north-east of the town of that name, on the Viazma. It is first mentioned in 1239, and, after being owned successively by the Lithuanians and Poles, it finally became Russian in 1634. In 1812, after a bloody battle between the Russian and French armies, in which the former was victorious, V. was demolished, and there are now hardly any remains of the old town. It carries on an active trade in corn, flax, hemp-seed, tallow, &c., and is the entrepôt for goods exported to St Petersburg and Riga. V. ginger-bread is exported to all parts of the empire. Pop. (1867) 9457.

VIBICES. This term is applied, in Medicine, to patches on the skin, varying in tint from bright red to violet, which occur in certain diseased conditions of the blood, and especially in purpura. They are caused by minute hæmorrhages of the capillaries of the true skin. The word is a Latin one, being the nominative plural of *vibex*—*icis*, the mark of a stripe.

VIBORG, the oldest city in North Jutland, and one of the oldest in Denmark, on a small lake, 25 miles west of Randers. Its cathedral, originally founded in the 12th c., was rebuilt in 1726. V., at which all the great highways of the interior converge, is important as a military post. Pop. (1872) 6422, engaged in the manufacture of woollen fabrics, leather, and tobacco.

VIBRIONIDÆ, a family of Infusoria, having an elongated or worm-like form, of which the ear-cockle (q. v.) is an example. They derive their name from their darting and quivering motion. Some of them, as the ear-cockle, are found in living plants, others in corrupting organic matter, as the *eels* of paste and vinegar.

VIBURNUM, a genus of plants of the natural order *Caprifoliaceæ*, having a 5-toothed calyx, a 5-lobed, wheel-shaped, bell-shaped, or tubular corolla, 5 stamens, 3 sessile stigmas, and a one-seeded berry. The species are shrubs with simple leaves, natives chiefly of the northern parts of the world. *V. opulus* is the Guelder Rose (q. v.), or Snowball Tree, and *V. Lantana* is the Laurustinus (q. v.), both well-known ornamental shrubs. *V. Lantana*, sometimes called the WAYFARING TREE, is a native of the warmer temperate parts of Europe and Asia, not unfrequent in England, and often planted as an ornamental shrub. It is a large shrub or low tree, with large elliptic serrated leaves, downy, with star-like hairs on the under side. The young shoots are very downy. The flowers are small and white, in large dense cymes; the berries purplish black, mealy, and mucilaginous, with a peculiar

sweetish taste, disagreeable to many, but relished by some. They are useful in diarrhoea and catarrh. Bird-lime is made from the roots in the south of Europe. The inner bark is very acrid, and was formerly used as a vesicant. The wood is white and hard, and is prized by turners. Tubes for tobacco-pipes are made of the young shoots.—Two North American species, *V. edule* and *V. oxycoccus*, nearly allied to the Guelder Rose, produce berries of an agreeable acid taste, which are used like cranberries.

VICAR (Lat. *vicarius*, from *vicem*, i. e. *gerens*, acting in the place of another), the title given to the substitute, whether temporary or permanent, employed to act in the place of certain ecclesiastical officials, whether individuals or corporations; as of the pope, a bishop, a chapter, a parish priest, &c. Vicars take different names from these various considerations. Vicars of the pope are called "vicars-apostolic," and they are generally invested with episcopal authority, in some place where there is no canonical bishop. Vicars of a bishop are either "vicars-general," who have the full authority of the bishop all over his diocese, or "vicars-forane" (Lat. *foraneus*, from *foris*, abroad), whose authority is confined to a particular district, and generally otherwise limited. A vicar-capitular is the person elected by the chapter of a diocese, during the vacancy of the see, to hold the place of the bishop, and to exercise all the authority necessary for the government of the diocese. The vicar-capitular, however, is not competent to do any act of episcopal order, as ordination, confirmation, &c. His power is restricted in other ways which it would be out of place to detail here. Parochial vicars are either perpetual, as in parishes which were anciently held in *Commendam* (q. v.), or which were held by religious corporations; or temporary, whose appointment may be recalled at pleasure, or after a fixed time. The name, in this sense, is sometimes given, especially in the Roman Catholic Church, to the assistant-priest, or, as he is called in England, the curate, in a parish. The functions of "vicars-apostolic" are described under the head **IN PARTIBUS INFIDELIUM**.

VICE-ADMIRAL. See **ADMIRAL** and **FLAG-OFFICER**.

VICE-CHAMBERLAIN. See **CHAMBERLAIN**, **LORD**.

VICE-CHANCELLOR, a judge in equity, appointed by the crown under letters-patent, to assist the Lord Chancellor of England. The title and functions are at least as old as the reign of Henry II.; but the office long fell into disuse, and was revived by statute 53 Geo. III. c. 24, appointing one vice-chancellor. Act 5 Vict. c. 6, s. 19, afterwards appointed two more, on the abolition of the equitable jurisdiction of the Court of Exchequer. The office is ancillary to that of the Lord Chancellor, for whom the vice-chancellor is empowered to act in his absence, besides being entitled to hold separate courts. The vice-chancellor and the Master of the Rolls are now part of the Chancery Division of the High Court of Justice, each sitting as a separate divisional court. The vice-chancellors hold their office *ad vitam aut culpam*, and are not bound, like the Lord Chancellor, to resign office with the ministry.

The vice-chancellor of a university is an officer who is empowered to discharge certain duties of the chancellor, chiefly those connected with granting degrees, in his absence.

VICE-CONSUL, a subordinate officer, to whom consular functions are delegated in some particular part of a district already under the supervision of a consul. A British vice-consul is selected by the consul under whom he is to act, and his name is transmitted for approval to the Secretary of State for Foreign Affairs. If he is approved of, the consul is directed to furnish him with authority to act, and to impart to him instructions similar to what he himself has received from the Foreign Secretary. The vice-consul acts under the general supervision of the consul, corresponding with him in ordinary cases, but in some special cases with the Foreign Office. A consul is not at liberty to dismiss a vice-consul acting within his district without the sanction of the Foreign Secretary; but if of opinion that sufficient grounds for the dismissal exist, his duty is to give information to the Foreign Secretary, suspending the vice-consul in the meantime, if the circumstances be urgent; and in all cases awaiting the decision of the Foreign Secretary, before taking ulterior steps.

VICENNIAL PRESCRIPTION, in the Law of Scotland, is the limitation which

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is put to certain actions after the lapse of 20 years, such as actions by heirs to reduce an erroneous retour.

VICENZA, a handsome city of Venetia, beautifully situated at the confluence of the rivers Bacchiglione and Retrone, 43 miles west of Venice by railway. The rivers are crossed by eight bridges, one of which, a bold single arch, is attributed to Palladio, who was a native of the city, and to whose genius it is much indebted for its beauty. V. is surrounded by a moat, and walls half in ruins, and contains many fine palaces and churches. The Piazza dei Signori, a remarkably fine square, contains a lofty and slender campanile, 270 feet high, and only 23 feet wide. The Palazzo della Ragione is a handsome Gothic building, by Palladio. The Palazzo Prefettizio, by the same architect, is a rich and fanciful Corinthian edifice. The Duomo, built in 1467, is Gothic; the nave of it is 60 feet wide; and in certain of the chapels are interesting pictures. The Teatro Olimpico, the scenery of which is fixed, and represents a species of piazza, with diverging streets of real elevation, but diminishing in size, is by Palladio. V. contains a lyceum, a seminary, and a picture gallery; a library, numbering 60,000 vols., and a hospital, and many benevolent institutions. Manufactures of silk, linen, earthenware, paper, and velvet are carried on. The surrounding country, studded with mansion-houses, and rich in vineyards, is exceedingly beautiful. Pop. (1872) 57,636.

V. (anc. *Vicentia*, or, more correctly, perhaps, according to inscriptions, *Vicetia*) is a very ancient city. An inscription records its existence in 136 B.C.; and it continued to be a municipal town of some consideration, till it was laid waste by Attila, 452 A.D. It revived again under the Lombards, and became for a time, in the middle ages, an independent republic.

VICEROY (Lat. *vice*, in place of, and Fr. *roi*, king), a title popularly given to any officer who is delegated by a sovereign to exercise regal authority in his name in a dependency, as the Lord-lieutenant of Ireland—who, however, is never officially so styled. It was the proper official designation of the governors of Naples, Spain, and Peru, under the old Spanish monarchy. See **KHEDIVE**.

VICH, or Vique, a city of Spain. In Catalonia, modern province of Genoa, on a hill-girt plain about 45 miles north of Barcelona. Its cathedral, built about 1040, but repaired and modernised about the end of the 18th c., is bold and elegant in the interior, and the Gothic cloisters are of the most rich and elegant description. Corn, fruit, and a bad wine are the products of the vicinity; and the inhabitants are employed in weaving, and in the manufacture of hats and paper. Pop. 12,100. V., the Roman *Ausa*, was afterwards called *Ausona* and *Vicus Ausonensis*, of the first part of which its present name is a corruption.

VICHY, a small town of the interior of France, in the dep. of Allier, stands on the Allier, in a fine valley, surrounded by hills clad with vines and fruit-trees, 35 miles s.e. of Moulins. Pop. (1876) 6154. V. is the most fashionable bathing resort in France. The springs which rise at the foot of the volcanic mountains of Auvergne (q. v.) are of the alkaline class, and the most efficacious of the kind that are known. They vary in temperature from 65° to 112° Fah., and are used both for drinking and bathing. They are resorted to in cases of indigestion, chronic catarrh, gout, &c. See **MINERAL WATERS**.

The virtues of the *aquæ calidæ* of this place were known in Roman times, as is testified by the numerous remains of marble baths and coins of the times of Claudius and Nero that have been dug up; but their modern repute arose only in the present century.

VICIA. See **VETCH** and **BEAN**.

VICKSBURG, a city and port of Mississippi, U. S., on the Mississippi River, 408 miles north of New Orleans, 44½ west of Jackson, built on a collection of high bluffs. It is the chief town between Memphis and New Orleans, exporting at present as many as 200,000 bales of cotton per annum. It was strongly fortified in 1861 and provided with a large garrison. In January 1862, it was attacked by the U. S. naval forces from Memphis and New Orleans, but without success. In April 1863, a naval attack was combined with the land forces under General Grant, who defeated General Pemberton near Jackson, cut off supplies and reinforcements from the garrison, and with a close siege and continual assaults, compelled a surrender, July 4,

1663, with 80,000 prisoners of war, 200 cannon, and 70,000 stand of arms. Pop. (1870) 12,443; (1880) 11,814.

VICO, Giambattista (or GIOVANNI BATTISTA), a jurist, philosopher, and critic, was born at Naples in 1668, spent the whole of his life in that city, and died there in 1744. He was the son of a small bookseller. He was educated by the Jesuits, and afterwards studied for the bar. Weak health preventing him from following his profession, he became tutor in jurisprudence to a nephew of the Bishop of Iscchia; and after filling this position for nine years, he obtained the chair of Rhetoric in the university of Naples. This office was poorly paid; but though much distinguished by persons of the highest position, V. did not succeed in getting a better one until the accession of the Bourbons in 1735, when he was appointed historiographer to the king of Naples. As he married early, and had a large family, his life was passed in great poverty, and it was, moreover, embittered by family troubles, and by constant ill-health. The great work which has made his name illustrious, the "*Scienza Nuova*," first appeared in 1725; but it was completely recast in a subsequent edition, published in 1780, with the effect of making it more imposing as a system, at the expense of a great loss of clearness. A third edition, in which the work was considerably enlarged, was published in 1745, shortly after the author's death. In the "*Scienza Nuova*," V. brought together, and attempted to fuse into a system, opinions which he had previously advanced in a somewhat numerous series of separate treatises. The work was long in arriving at its proper place in European literature, which must be in a great measure attributed to its obscure and enigmatical style. Much of the obscurity arises from the use of an unorthodox terminology, which the author often leaves unexplained, and (in the case of the later and authoritative editions) from the rigorous application of the deductive method to subjects which do not always admit of it. The "*Scienza Nuova*" was virtually unknown out of Italy in 1822, when a German translation of it appeared at Leipzig. It was, a few years later, translated into French (with some curtailment) by M. Michelet ("*Principes de la Philosophie de l'Histoire, traduits de la 'Scienza Nuova' de G. B. Vico*," Paris, 1827), and the author has since that found his proper rank among the most profound, original, and ingenious of modern thinkers.

The "*Scienza Nuova* (*De' Principj d'una Scienza Nuova d'Interno all'a Comune Natura della Nazioni*") may be described as a *Novum Organum* of politico-historical knowledge. Observing, amid the infinite variety of thoughts and actions, of language and manners which the history of nations presents, a constant recurrence of the same characteristics, in the political changes which peoples the furthest removed from each other in time and place, have passed through, an essential similarity of development, V. proposed to himself the task of distinguishing amid social phenomena the regular from the accidental; of finding out the laws which govern the formation, the growth, and the decay of all societies; in fine, of tracing the outlines of the universal, the ideal history of society—the idea of which he himself believed to have existed from eternity in the mind of God. In doing this, he attempted, by means of historical criticism on the widest basis to illustrate the inter-dependence of all the sciences; to shew that the progress of each of them is related to that of all the others, and the progress of all of them dependent upon, while also acting powerfully upon the general condition of society. And while holding that the actual state of every society is the result of a free development of the human faculties, he attempted to give a historical demonstration of the existence of a Divine Providence directing the career of nations, overruling the designs which men propose to themselves; operating, however, not by positive laws, or arbitrary interferences, but by means of methods and expedients which men resort to freely. It has been not inaptly said that the "*Scienza Nuova*" includes a system of social (as distinguished from natural) theology—a demonstration of God's government of the world, and of the laws in which that government consists. V., in these inquiries, accepted from Descartes the individual consciousness as one of the criteria of truth; but he also employed another—the collective consciousness, or the common sense of mankind—the accord of the race, as it may be gathered from history—in a word, authority.

It would be difficult to overrate the ingenuity and originality of many of the inquiries into which V. was led by the attempt to delineate the ideal history of society; and he has rarely failed to put forward views rational and probable compared with those which were accepted among his contemporaries. With a truly admirable

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insight, he has not seldom hit upon the conclusions to which increased social knowledge and more scientific conceptions have conducted inquirers of later generations. Thus, in clearing the ground for the foundation of his system, he was led to precisely those views about Homer and the authorship of the Homeric poems which are popularly associated with the name of Wolf; and to anticipate the general view of the credibility of early Roman history which was elaborated by Niebuhr. (See also **COMTE**, the germs of many of whose speculations may be found in Vico.) The beginnings of religion, the origin of poetry and language, the commencement of society (which he ascribes to the influence of a common religious belief and worship), the foundation of the privileges of the heroic or aristocratic class, are among the earlier subjects of his speculation. He proceeds to trace the origin of jurisprudence, and to shew how its development has been dependent upon social changes; and he afterwards deduces from the history of ancient societies, and in some degree from the history of the governments which sprung out of the ruins of the Roman Empire, the laws which govern the progress, the conservation, and the decay of nations. A monarchy, with an equality of civil and political rights as between subjects, was his ideal of good government for advanced societies.

Though he ascribed to religion a paramount influence in forming and in conserving society, and though it was one of his principal objects to demonstrate the divine government of the world, V. did not escape the suspicion of having written in a spirit of hostility to religion. It was alleged that he had written so obscurely, as he often did, through the fear of incurring ecclesiastical censures. Some critics of another school charged him, with at least equal plausibility, of having striven, both in his particular doctrines and in his consecration of the principle of authority, to satisfy the Roman Catholic Church. The cavils made on either side, however, do not seem deserving of much attention; and it is pleasant to know that V., though not unconcerned about the accusations made against him, felt in his later years consoled for the many trials and disappointments of his life, by the completion of a work, the greatness of which he knew better than any of his contemporaries. When Vico had published his *Scienza Nuova* a load was off his mind. The task of his life had been brought to a conclusion. "Since I completed my great work," he says, in 1726, "I feel that I have become a new man. I am no longer tempted to declaim against the bad taste of the age, because in denying me the place which I sought it has given me time to compose my *Scienza Nuova*. Shall I say it? I perhaps deceive myself, although most unwilling to do so; the composition of that work has animated me with a heroic spirit which places me above the fear of death and the calumnies of my rivals. I feel that I am seated upon a rock of adamant, when I think of that law of God which does justice to genius by the esteem of the wise."

The writings of Vico after his death fell into comparative neglect, and they remained almost unknown for nearly half a century. When Goethe visited Italy, in 1787, he made the acquaintance of Filanghieri, who had just risen to distinction by his great work on legislation. The brilliant young Neapolitan talked of the subjects on which he had written, of his favorite authors, Montesquieu and Beccaria, but above all of Vico, whom he never quoted without a burst of patriotic enthusiasm. Goethe, after a hurried perusal of the *Scienza Nuova*, which was lent to him as a sacred deposit, formed a high estimate of his merits. Preoccupied, however, with other subjects of inquiry, he did not speak of it with sufficient emphasis to bring it prominently under the notice of Northern scholars. It was M. Ballanchi who first directed attention in France and Germany to the value of the philosophical notions expounded by Vico. Since this period his reputation has rapidly grown, and we are now accustomed to see him associated with Bacon, Spinoza, and Leibnitz, as one of the greatest and most original thinkers of modern times.

The best editions of the collected works of Vico are those published at Naples in 1818 and 1835 by the Marquis of Villa Rosa, and those published at Milan more recently by G. Ferrari, under the title of *Opere di G. B. Vico ordinate ed illustrate da G. Ferrari*, the second edition of which was published in 1854.

VICTOR, Sextus Aurelius, a Latin historian, lived in the age of Constantine and Julian. From the term in which he speaks of Africa, describing it as "decus

terrarium," it has been conjectured that he was a native of that region. According to his own account he was born in the country, and was the son of a poor and unlettered father. We learn from Ammianus Marcellinus that the Emperor Constantius having seen Victor the historian at Sirmium, afterwards appointed him prefect of Pannonia Secunda, and honored him with a brazen statue. At a subsequent period, as we learn from the same authority, the office of prefect of the city was likewise conferred upon him. He is supposed to have been the same individual who in A. D. 369 was consul along with Valentinian. It has been inferred that he was not a Christian.

Aurolius Victor appears to have been the author of a work—*De Vita Illustribus Urbis Romæ*, which has repeatedly been printed under the names of Cornelius Nepos, Suetonius, and the younger Pliny. The first of his illustrious men is Procus, king of the Albani, the last Sextus Pompeius. Of this work his tract *De Cæsaribus* is to be regarded as a continuation. It commences with Augustus, and terminates with Julian. This tract first appeared in an edition of the author's works published by Andreas Schottus. Antwerp. 1579, 8vo. Here we likewise find the earliest impression of the tract entitled *Origo Gentis Romanæ*, but whether it is a genuine production of the same author has been considered as extremely doubtful. Another work commonly ascribed to him bears the title *De Vita et Moribus Imperatorum Romanorum; excerpta ex libris Sæpti Aurelli Victoris. a Cæsare Augusto usque ad Theodosium Imperatorem.* This title is not applicable to a work composed by Victor, but to one compiled from his writings.

VICTOR, Claude Perrin, Duke of Belluno, and Marshal of France, was born, 7th December, 1764, at La Marche, in the dep. of Vosges, and at the age of 17 enlisted as drummer in a regiment of artillery. He received his discharge after eight years of service as a common soldier; but re-enlisted in 1792, and having fortunately attracted the attention of Napoleon by his able conduct at the siege of Toulon in 1793, was promoted, through his influence, at the close of that year. In the Italian campaigns of 1796—1797, and 1799—1800, he commanded the vanguard, and aided by the favor of Napoleon, who threw opportunities in his way, displayed great skill and extreme daring on numerous occasions. At Marengo he maintained such an obstinate resistance for eight hours to the overwhelming numbers of the enemy, that the expected reinforcements had time to arrive, and convert the imminent victory of the Austrians into a crushing defeat. In 1806, he commanded with distinction a corps d'armée in the Prussian and Russian campaigns, and though captured in 1807 by Schill's partisans, he was exchanged (for Blücher) in time to win, on the bloody field of Friedland, the baton of Marshal of France, and the title of Duke of Belluno. As governor of Berlin, he gained the esteem of the Prussians by his dignity and moderation; and in 1808, he was sent to command the first corps d'armée in Spain. Here he gained several victories, notably over Blake at Espinosa, and Cuesta at Medinilla; but was defeated by Wellington in the obstinate battle of Talavera (q. v.), and again by Sir Thomas Graham at Barrosa (q. v.). After a fruitless blockade of Cadiz, he was recalled to command the ninth corps d'armée in the Russian campaign of 1812; and though occasionally defeated in his many contests with the Russians, his general conduct and success were worthy of his previous high reputation. When the allies, in overwhelming numbers, were closing round France, V. appeared prominently in the fore-front of the defence, made a valiant stand at the passes of the Vosges, and retook Saint Dizier and Brienne at the point of the bayonet; but his neglecting to occupy the bridge of Montereau was a fault which Napoleon could not pass over, and he was deposed in favor of Gérard (q. v.). Notwithstanding this disgrace, he persisted in continuing with the army, and his zeal for his country suffered no diminution, as his energetic conduct at subsequent minor combats, and at the battle of Craonne, sufficiently proved. A severe wound which he received at this last battle brought his military career to a close; and had it chanced to be mortal, the character of V. would have stood out in bold relief on the page of history as an able soldier, a faithful friend and follower, and a sterling patriot. But though not mortal, in a physical sense, it brought death to his hitherto spotless reputation; for the sickening ardor of his professions of loyalty to the Bourbons, and his vile calumniations of the now fallen chief, to whom he wholly owed his rise, displayed the foulest ingratitude. V.'s servile attachment to Louis XVIII., however,

gained him a peerage and other honors; but the readiness with which he accepted the presidency of the military commission appointed to try such of his old companions in arms as had deserted to Napoleon during the "Hundred Days," brought upon him merited obloquy. His subsequent career requires but brief notice; he was minister of war in 1821-1823; second in command in the Peninsula in 1823; and was afterwards accredited as ambassador to the court of Vienna. The Austrian court refused to receive him unless he laid aside his ducal title; and this question of etiquette attracted so much attention, and gave rise to so much vehement discussion, that the good understanding of the two countries was for a time endangered. After this event, V. took no part in public affairs, and died at Paris, March 1, 1841.

VICTOR-AMADEUS, the name of three sovereigns of the House of Savoy. —**VICTOR-AMADEUS I.**, Duke of Savoy, succeeded his father, Charles-Emmanuel the Great, in 1690, and carried on the war with France; but in 1691, he was forced to surrender Pignerol, La Perouse, Auntrone, and Luzerne to France, in exchange for Montferrat and Alba. He paid great attention to the internal improvement of his dominions, and re-established the university of Turin on an extended scale; but the irresistible pressure exercised on him by Richelieu, forced him into a war with the Spaniards in Italy; and after routing his opponents at Tornavento (1696) and Montebaldone (1697), he died at Vercelli, October 7, 1697. —**VICTOR-AMADEUS II.**, grandson of the preceding, and one of the most able of princes, who born May 14, 1666, and succeeded his father, Charles Emmanuel II., in June 1675. Till 1690, the administration of government was in the hands of his mother, Marie Françoise de Nemours, who, in spite of the pressure of France on one side and Austria on the other, succeeded in preserving a neutral attitude in the quarrels between her two powerful neighbors. In 1694, V. married Anne Marie of Orleans, the niece of Louis XIV.; but the overbearing insolence of the "Grand Monarque," who forced him to persecute the Waldenses (q. v.), and arrogantly ordered him to contribute an auxiliary force to the French army, and give up the citadel of Turin, roused the ire of the high-spirited young duke, speedily put an end to the good understanding which would naturally have accompanied their intimate relationship, and drove him into a league with Austria and Spain against France. In revenge, a French army under Catinat assailed V.'s dominions, and though he was reinforced by 4000 Austrians under his relative, Prince Eugene, the allies were completely routed at Staffarda (August 1690), and the victorious Catinat had completed the reduction of Savoy and Nice before the winter of 1691. The duke, aided by considerable reinforcements from Austria and Spain, gallantly maintained the contest; but a second and much more disastrous defeat at Marsaglia (October 4, 1693), where he left 10,000 dead on the field, put almost the whole of Piedmont at the mercy of the French. The war, however, continued; the duke's obstinacy and almost romantic daring balancing Catinat's high military genius; till in the autumn of 1696, a treaty much more favorable to Savoy than to France, detached the former from the grand alliance. When the quarrel respecting the Spanish Succession (q. v.) broke out, V. took part with France—an alliance cemented by the marriage of his second daughter, Louisa Gabriele, to Philip of Anjou, the new monarch of Spain, as well as by the previous (1697) marriage of his eldest daughter (the mother of Louis XV.) to Louis, Duke of Burgundy, Louis XIV.'s grandson—and was appointed commander-in-chief of the combined armies of France and Spain; but though he was aided by the counsels of his old opponent Catinat, the Austrians, under his former ally, Prince Eugene, defeated him at Chiari (November 1701), and drove him behind the Oglio. Two years afterwards, the successes of Vendôme in Italy and Villars in Germany, by bringing more prominently before his imagination the possibility of having the Bourbons for his neighbors on the east as well as on the west, along with the tempting offers of Austria and Britain, induced him to abandon France, and join the alliance against her. In revenge for what they called the duke's treachery, the French under Vendôme overran and devastated Piedmont; but with the recall of their chief, fortune deserted the French, and they were totally routed by the duke and Prince Eugene under the walls of Turin, 7th September 1706. The duke, who had some years before retired from this contest, was rewarded by the treaty of Utrecht (1713) with the rest of Montferrat, Val-Sesia, Lomellina, and the island of Sicily, with the title of king; besides being ac-

knowledge as heir to the Spanish throne, in case of the failure of the Bourbon dynasty. In 1720, he was made to surrender Sicily to the emperor in exchange for Sardinia. The latter portion of V.'s long reign was wholly free from foreign strife; and his restless energy was employed in improving the system of administration, thoroughly assimilating the new continental acquisitions, in replenishing the treasury, which in spite of the British subsidy, had been drained by the long contest with France, and in encouraging agriculture and industry, especially the cultivation of mulberry trees and tending of silk-worms. Reforms and improvements were effected in the university of Turin, and several colleges founded. On September 2, 1730, the king abdicated; but attempting, in the following year, to resume the regal dignity and functions, he was arrested and imprisoned. He died at the chateau of Moncalieri, near Turin, 31st October 1732.—**VICTOR-AMADEUS III.**, grandson of the preceding, succeeded his father Charles-Emmanuel III. in 1773. His reign was full of misfortune and disaster, and was brought to a close by his death in 1796, after the compulsory cession of Savoy and Nice to the French Republic.

VICTOR-EMMANUEL I. (Ital. *Vittore-Emanuele*), king of Sardinia, the second son of Victor-Amadeus III., was born 24th July 1759, and till his accession, bore the title of Duke of Aosta. He was one of the most determined adversaries of the French Revolution; and on the outbreak of war in 1793, he was chosen to command the Sardinian army, repulsed the French at Gillette, and forced his way to the mouth of the Var, but was ultimately compelled to seek shelter among the Alps. He opposed himself strongly to the conclusion of peace with France in 1796; and from this time lived in Southern Italy, and afterwards at Cagliari, whence he did not return to Turin till 1814. He had assumed the royal title on his elder brother's abdication in 1802; and the treaty of Paris restored to him Piedmont, Nice, and the half of Savoy in 1814; the treaty of 1815 added the remainder of Savoy, while the Congress of Vienna presented him with the duchy of Genoa—so that the little kingdom had profited territorially by its troubles. But the loyal delight of the Savoyards and Piedmontese at the return of their legitimate ruler was speedily quenched by the first acts of his administration. The French institutions to which they had been long enough accustomed to feel their immense superiority over the system they had supplanted, were abolished, and the old absolutism gradually restored. This change, which was no doubt to a certain extent effected by way of destroying all trace of French domination, by depriving the people of various important privileges and amenities, restoring old and hated abuses, and increasing taxation, excited wide discontent, which was heightened by the odious religious persecutions of the Vaudois and the Jews; secret societies were formed, and on March 10, 1821, a revolution broke out. The army proclaimed the constitution promulgated by the Spanish Cortes in 1812; and the king, rather than take the oath to it, resigned in favor of his brother, Charles Felix, March 23, 1821. He died at Moncalieri, near Turin, January 10, 1824.

VICTOR-EMMANUEL II., the first king of a united Italy, was the son of Charles-Albert (q. v.) of Sardinia, and was born March 14, 1820. He was a pupil of the Jesuits, but under his father's superintendence received an excellent education; and, being heir to the throne, he commanded, in accordance with an old custom of his House, the brigade of Savoy in the campaign of 1848—1849, and displayed great gallantry at Goito and Novara. On the evening of the latter battle, his father, seeing the hopelessness of the struggle, and unwilling to how to the onerous conditions offered by Radetzky, abdicated in favor of V., who, being the husband of the Archduchess Adelaide (the cousin of the Austrian emperor), and uncommitted to the views of the Italian Ultra-democrats, might hope to obtain more favorable terms from the victor. V. thus ascended the throne of Sardinia, 23d March 1849, and restrained effectually, for a time, the enthusiasm of the more ardent among the national party, though, on the other hand, he maintained, with the utmost fidelity, the provisions of the liberal constitution granted by his father. He made a happy choice of ministers in such men as Cavour, D'Azeglio, &c., whose policy it was to increase the strength and importance of the country by improved administration, rigid economy in the finances, care of the army, and encouragement to trade by the conclusion of commercial treaties with foreign nations. They saw too clearly that, despite the intense and almost unanimous desire for unity throughout Italy, a cou-

test single-handed with Austria was utterly hopeless, and preferred, till a more convenient season, to seem to renounce all idea of any such project. The property of the state was sold, and various measures calculated to greatly diminish the privileges, and restrict within moderate limits the inordinate influence of the clergy, adopted—changes which brought upon the king the thunders of the Vatican; but V., nothing daunted, protested by a vigorous “*memorandum*,” and more obstinately ascertained and maintained his independence of the papacy. The revolt at Genoa was sternly suppressed; but the king and his ministers were, in secret, by no means displeased to see that the feeling of nationality was still vigorous; for, following the traditional policy of the House of Savoy, he was only biding his time to “descend with the valley of the Po,” and swallow “another loaf of the artichoke.” With the view of improving his position in Europe, and gaining a place at its council-board, he sent an army of 17,000 men, under La Marmora, to take part in the Crimean war on the side of Turkey; and visited (1855) in person the courts of Paris and London, being received by French and English with great enthusiasm. After the peace of Paris (1856), he entered into a closer alliance with France, gave his elder daughter Clotilde in marriage (30th January 1859) to Prince Napoleon, and backed by the French arms, provoked a war with Austria. The campaign was brief but decisive—the Austrians were routed in every battle, and the Italians were hailing with exultation the near approach to fulfilment of their long-cherished dreams of unity, when the suddenly-concluded peace between France and Austria at Villa-Franca, dashed their hopes to the ground. The Milanese (minus the fortresses of Mantua and Peschiera) only was added to the Sardinian monarchy, and for this the king ceded Nice and Savoy (the cradle of his race) to France as the price of his alliance. But the people of Central Italy refused indignantly the offer of Prince Napoleon as their sovereign; and Tuscany, Modena, Parma, and the Romagna, renouncing their allegiance to their respective sovereigns, voted for annexation to Sardinia, and were formally adopted by V. as his subjects. This was a greater advance towards the unification of Italy than the French emperor wished, and accordingly, V., who was still dependent on his ally for safety, though secretly favorable to Garibaldi's expedition to Sicily, disavowed all knowledge of this project, and after the island was conquered without a blow being struck by a single Sardinian soldier, forbade the “*Italian Liberator*” to pass over to the continent; yet he subsequently, with the consent of Napoleon III., sent an army to aid Garibaldi in conquering Naples, and formally accepted the sovereignty of the Two Sicilies. But in 1862, Garibaldi, thinking that the conquest of Rome in the same way would be equally acceptable to his sovereign, returned to Sicily, raised an army of volunteers, and was rapidly advancing on the ancient capital, when V., forced by France, put an end to the expedition by capturing Garibaldi and his army at Aspromonte. Though proclained by the Senate and House of Deputies *King of Italy* in February 1861, V. prudently postponed all attempts to annex Rome and Venice; and directed his attention to the internal affairs of his kingdom, which was much distracted by the intrigues of the sovereigns whom he had supplanted. At length, in the quarrel between Prussia and Austria for supremacy in Germany, appeared his opportunity; and an offensive and defensive alliance with Prussia was followed by an Italian invasion of Venetia (June 1866). The Italians were defeated in the bloody battle of Custoza; but the disasters which befell Austria in her simultaneous contest with Prussia, forced the Austrian empire ultimately to surrender Venetia. In August 1870, after the outbreak of the war between France and Germany, the last detachment of the French garrison which had occupied Rome since 1849 was withdrawn; the imperial city, finally united to the kingdom, became the capital of Italy and the seat of V.'s court. The last years of V.'s life were uneventful. He died after a short illness, 9th Jan. 1878, and was succeeded by his son Humbert.

VICTORIA I. Queen of the United Kingdom of Great Britain and Ireland, daughter and only child of Edward, Duke of Kent, 4th son of George III., was born at Kensington Palace, May 24, 1819. Her mother, Victoria Mary Louisa, was 4th daughter of Francis, Duke of Saxo-Coburg-Saalfeld, and sister of Leopold, late king of the Belgians. Her first husband, the Prince of Leiningen, died in 1814; and on the 11th July 1818, she married, at Kew, the Duke of Kent. The duke died January 28, 1820, leaving his widow in charge of an infant daughter only eight months old,

who had been baptised with the names of Alexandrina Victoria. The Duchess of Kent fulfilled the important duties which devolved upon her with more than maternal solicitude, and with admirable care and prudence. The infant princess, as she grew up, was taught to seek health by exercise and temperance, to acquire fearlessness even from her amusements, such as riding and sailing, and to practise a wise economy united to a discriminating charity. After a few years, the Duchess of Northumberland was associated with her mother in her nurture and education. The Princess V. became accomplished in music, drawing, and the continental languages; and acquired a knowledge of some of the sciences, particularly botany. Her father having belonged to the Whigs, her political education was naturally derived from the members of that party; and to Viscount Melbourne (q. v.) belongs the credit of having thoroughly instructed her in the principles of the British constitution. She ascended the throne of the United Kingdom on the demise of her uncle, William IV. (q. v.), June 20, 1837; her uncle, the Duke of Cumberland, becoming king of Hanover, in virtue of the law which excludes females from that throne. By this event, the connection which had lasted for 125 years between the crowns of England and Hanover was terminated. Victoria was proclaimed June 21, 1837, and crowned at Westminster, June 28, 1838. She found on her accession Viscount Melbourne at the head of the government; and during his premiership, and with the cordial assent of her subjects, the young queen was married at St James's Palace (February 10, 1840) to Prince Albert (q. v.), Prince of Saxe-Coburg and Gotha, and second son of the then reigning duke. Her Majesty has had issue—four sons and five daughters: the Princess Royal, Victoria, born November 21, 1840, married, Jan. 25, 1858, to Frederick William, now Crown Prince of Prussia; and heir-apparent to the throne of Prussia; Albert Edward, Prince of Wales, heir-apparent to the throne of the United Kingdom, born Nov. 9, 1841, married, March 10, 1863, Princess Alexandra of Denmark, eldest daughter of Christian IX., king of Denmark; Princess Alice, born April 25, 1843, married, July 1, 1862, Prince Frederick William of Hesse; Prince Alfred, born August 6, 1844, created Duke of Edinburgh 1866, married, Jan. 23, 1874, Marie, only daughter of the Emperor of Russia; Princess Helena, born May 25, 1846, married, July 5, 1866, to Prince Christian of Sleswig-Holstein-Sonderburg-Augustenburg; Princess Louise, born March 18, 1848, married, March 21, 1871, to the Marquis of Lorne; Prince Arthur, born May 1, 1850, created Duke of Connaught 1874; Prince Leopold, born April 7, 1853; Princess Beatrice, born April 14, 1857.

It will be sufficient to mention here a few of the more memorable events of this eventful reign. The changes of administration may be traced in the articles GREAT BRITAIN, MELBOURNE, PEEL, RUSSELL, DERBY, ABERDEEN, PALMERSTON, GLADSTONE, DISRAELI. The legislative measures of greatest importance were the establishment (1840) of the penny-postage (see POST-OFFICE); the Amendment of the Poor Laws (q. v.) in Scotland (1845) and Ireland (1847); the Abolition (1846) of the Corn Laws (q. v.), and (1849) of the Navigation Laws (q. v.); the Irish Encumbered Estates Act (see TITLE, &c.); the transfer (1856) of the Indian possessions from the East India Company to the crown (see INDIA); the admission (1858) of Jews into the House of Commons; the Reform Act of 1867; the Disestablishment of the Irish Church (1869); the Irish Land Act (1870); the Abolition of Purchase in the Army (1871); the Elementary Education Act for England (1870), and the Scotch Education Act (1872). See NATIONAL EDUCATION. Other events which will signalise this period of British history were the formation of the Free Church (q. v.) of Scotland (1843); the discovery of the North-west Passage (q. v.) by Sir Robert M'Clure (1850); the Exhibitions (q. v.) of 1851 and 1862; the discovery of gold in Australia (q. v.) and in British Columbia; the war (1854–1856) with Russia (q. v.) in defence of Turkey (q. v.), in which the siege of Sebastopol and the sufferings of the British army form the most prominent episodes; the Indian Mutiny, in 1857 (see INDIA); the Volunteer (q. v.) movement (1859); the establishment (1866) of telegraphic communication with America (see TELEGRAPH); the Abyssinian War, 1861 (see THEBOPRE); the formation of the Dominion of Canada, 1867 (see CANADA); and the Ashantee (q. v.) War, 1813–1874. The same period has witnessed the most signal changes among surrounding nations; 1848 was a year of European revolutions, during which the only disturbance in Great Britain was an abortive Chartist demonstration (see CHARTISM). The constitutional monarchy of France (q. v.) fell, and was succeeded by a republic, which soon gave place (1862) to the

second Empire under Louis Napoleon (q. v.), followed again by a republic in 1870. The great civil war in the United States of America (q. v.) has resulted in the extinction of slavery; the formation of the kingdom of Italy (q. v.) has been completed by the acquisition of Venetia and Rome; the unification of Germany, begun by the formation of the North German Confederation, as the result of the war between Prussia and Austria in 1866, has been consummated by the events of the Franco-Prussian War (1870—1871); and the ever formidable "Eastern Question," raised again in 1876 by the insurrection in Herzegovina led in 1877 to war between Russia and Turkey, and to sweeping changes in the Balkan Peninsula (see *TURKEY*).

In 1876, "Empress of India" was added to the royal titles of Queen V. The premature death of the Prince-Consort (see *ALBERT*) on December 14, 1861, caused the Queen to seclude herself for several years from public life: Queen V. has published two volumes—"The Early Days of His Royal Highness the Prince-Consort;" and "Leaves from the Journal of Our Life in the Highlands" (1869).

"In Queen Victoria," according to Macaulay, "her subjects have found a wiser, gentler, happier Elizabeth." No former monarch has so thoroughly comprehended the great truth, that the powers of the crown are held in trust for the people, and are the means, and not the end of government. This enlightened policy has entitled her to the glorious distinction of having been the most constitutional monarch this country has ever seen. Not less important and beneficial has been the example set by her majesty and her late Consort in the practice of every domestic virtue. Their stainless lives, their unobtrusive piety, and their endeavor to educate the royal children so as to be a pattern to every other family in the kingdom, have borne rich fruit in the stability of the throne, and have obtained for the royal family of England the respect and admiration of the civilised world.

The progress made by the nation in the various elements of civilisation, especially in that of material prosperity, has been unparalleled (see *GREAT BRITAIN*); and perhaps during no reign has a greater measure of political contentment been enjoyed.

VICTORIA, although one of the youngest and, in point of area, the smallest of the colonies of the Australasian group, is already the most important. In extent of commerce, indeed, it takes precedence of all other colonies—India alone excepted. The extreme modernness, so to say, of the Australian colonial picture is one of its most striking features, for it belongs emphatically to the present generation. Men who are still in middle life may recollect when the Port Phillip Settlement—the name first given to V.—had no existence; and those are not yet very old who may remember when even the geographical outline of Australia was incomplete, and when the great harbor of Port Phillip, now the busy scene of the world's commerce, was undiscovered and unheard of.

Geographical Position and Extent.—V. comprises the south-east corner of Australia, at that part where its territory projects furthest into cool southern latitudes. Wilson's Promontory, to the south-east, the most southerly headland, just passes the 39° of s. lat.; while the most northern point, which is at the opposite or north-west extreme, is in s. lat. 34°. The long, comprises 9°—between 141° and 150° e. of Greenwich. To the w. is the colony of South Australia, separated by the 141° of e. long.; to the n. is New South Wales, separated by the line of the Murray River eastwards from 141° e. long. to its source, and thence by a straight line south-east to Cape Howe; and from Cape Howe to South Australia, again, the colony is bounded on the s. by Bass's Strait. The extreme length is east and west, and is about 490 miles, by an extreme width, north and south, of 250 miles. But a remarkable indentation of both the north and south boundary opposite each other, about the middle of the colony, reduces the breadth between the head of the Port Phillip inlet and the Murray to only 120 miles. The superficial area is 56,446,790 acres, or 88,198 sq. miles.

Physical Aspect.—Although V. may be called mountainous, as compared with the general flatness of Australia, it has much of the quiet and peculiar scenery characteristic of that division of the world. Vast naked plains are deviously traversed by broad and deep river-channels, which are mostly, however, mere chains of ponds, if not altogether dry, excepting in winter and spring, or after heavy showers. Overspread, in cool and moist seasons, with brilliant verdure, the drought and heat of summer

quickly convert the grass into a natural hay, which, in the scarcity of sustenance from its ceasing to grow in that condition, is eaten off to the very roots by the sheep and cattle, leaving the surface a bare and blackened mass. The "open forest" is another and very pleasing variety of scenery characteristic of Australia, and largely prevalent in Victoria. It distinguishes the gently undulating country of the better soils, whose surface is overspread by large trees, chiefly of the red gum (*eucalyptus*) and silver wattle (*acacia*). The trees being widely apart and of spare foliage, and the surface free from underwood, there is commonly a good growth of grass, the whole presenting a charming and park-like aspect, although felt to be somewhat tame and monotonous, especially under the great defect of most Australian landscapes, the general want of water. Mountain and forest prevail most in the east division, where the Australian Alps of Gipps' Land, the loftiest of Australian chains, culminate in peaks ranging from 1000 to 7000 feet above the sea. The west district, on the other hand, is chiefly remarkable for its numerous isolated hills of volcanic origin, some of them with craters still perfect, which probably have not, in a geological sense, been very long at rest. To this extensive volcanic system, V., owes the large proportion of its good arable land, as compared with the light sandstone and granitic soils that prevail elsewhere in Australia. The chief rivers, besides the Murray and its branches (elsewhere treated of), are the Suowy River, the Tambo, the Mitchell, the Macallister, and the La Trobe—all of Gipps' Land; the Yarra-Yarra, the Goulburn, the Loddon, the Wimmera, the Avoca, the Wannon, the Owens, the Hopkins, and the Glenelg, of which rivers, however, several are not perennial streams. The Australian fauna is very remarkable; notably the kangaroo or pouched family, and the emu or great wingless bird. There are besides the *echidna* and *platypus*, of quite a different family, and even more singular in structure, especially the last, as indicated by its other name of *Ornithorhynchus paradoxus*. The dingo, or native dog, is remarkable as a non-mammalian exception, on which account it has been regarded as an introduction by human agency. But several years ago, Professor McCoy of Melbourne met with its fossil remains associated with those of extinct animals, and in deposits that, although recent, geologically speaking, are in other respects so remote as to establish this animal's indigenous claim.

Climate.—This is on the whole healthful and agreeable, but subject to frequent and sudden change in condition and temperature. The average temperature of the year is between 87° and 59° , or about 9° above that of London, and 11° above that of Edinburgh. The common summer-heat is from 65° to 80° , with an occasional advance to 90° and even to from 100° — 108° during hot winds and a dry season. The winter range is mostly from 45° to 60° . Ice occurs in the midwinter of July, but it rarely, except on elevated ground, survives the noontide sun. Every few years, an unusually severe season will cover the higher levels, and even the country generally, with snow, to recall to the colonists the familiar scenes of ancestral homes. The cold of winter is keenly felt, and household fires are not uncommonly indulged in for over six months of the year, especially in the morning and evening.

Civil and Political Divisions.—Victoria is divided into four districts and 37 counties, the principal counties being Bourke, Talbot, and Grant. Prior to 1848, there were but three counties, the still existing Bourke, Grant, and Normanby, laid out in 1837, along with the sites of several chief towns, when the infant settlement, then but two years old, was officially taken charge of by the New South Wales government, within whose jurisdiction the territory was then comprised. One chief object of the counties was to distinguish by certain special regulations the more accessible and valuable of the colonial lands, leaving the remainder (the districts) to pastoral or squatting uses. But the subsequent discovery of the gold-fields in 1851 interfered with this arrangement, as the new condition created towns and markets indiscriminately in county and district. Squatting is still an important colonial vocation, second only to gold mining, and still pursued over most of the colonial area. The electoral districts, in general, coincide (but not always) with county and municipal divisions. This is the case for the Assembly, but for the Council or Upper House there is a special division of the colony into six great districts. A law of the colony specially facilitates townships to become municipalities; and as early as 1861, there were 61 such towns, all of them with their respective mayors and corporations.

History.—The distinction of first settling V. is due to the Messrs Henty of Launceston, Tasmania, who occupied the south-west part at Portland Bay with some flocks of sheep in 1834. But the settlement that mainly influenced the future was that of the following year upon the shores of Port Phillip. This enterprise also was from Launceston, first in May and June by a small party under Batman, which occupied Indented Head, on the west side, 15 miles inside the harbor; and again in August following by another party sent forth by Fawkner, he himself having been detained a short while longer by sickness. This last party passed on to the head of Port Phillip, ascended the Yarra, and settled upon the site of the present capital, Melbourne. The story of the subsequent progress is marvellous even in an age of marvels as to colonies. When the gold mines were discovered, the settlement, after 16 years' existence, had a colonial population of 80,000, of whom nearly one-third were in the capital. Thenceforth for several years the advance has scarcely been paralleled. The imports, exports, and the public revenue increased tenfold. In 1858, Melbourne had become a city of great wealth and commerce, containing 100,000 inhabitants, while the colony comprised above 400,000. Although the race has since been at a more leisurely speed, Melbourne has continued to advance, and has been greatly improved and beautified. See MELBOURNE. Some interior towns, besides, are rising to importance, in particular, Ballarat. Geelong, with 16,000 of population, finely situated on the western arm of Port Phillip, was long second only to Melbourne, but is now surpassed by Ballarat (with 48,000) and Sandhurst (with 27,000), the two principal gold-field towns of Victoria. The pop. of V. in 1871 was 731,523, of whom 330,478 were females; in 1877 the pop. was 849,021.

V., while a part of New South Wales, was termed the Southern or Port Phillip District of that colony. As early as 1840, an agitation for separation, and a government independent of that of New South Wales, began, and was ended successfully in 1851, when the new colony received the name it now bears. The title of Lieutenant-governor was then given to the Queen's representative in this colony as well as in others adjacent, the Governor-general being in New South Wales. But the rising importance of V. led to this distinction being discontinued some years afterwards. This importance indeed expedited, to these colonies, their concession of self-government, which was inaugurated in the years 1854–1856, with very lively demonstrations on the part of the colonists, who have since shown no want of interest or earnestness in the charge of their own affairs. During this last brief term, although the progress, in point of population, owing to diminished immigration, has been unimportant, there has been a very marked advance in the improvement of the colony generally, and of the arts and industries and amenities of social and commercial life. At the Great International Exhibition of 1882, V. stood at the head of the entire colonial department, its contribution having been officially described as "embracing the largest and most varied collection of objects ever sent by a British colony to Europe."

Population, Colonists.—The population of V., in common with that of the other members of the group, is in the main English, in the wider sense of the word. The whole foreign element, including Germans and Chinese, does not exceed one-tenth. Of that proportion, the Chinese, whose sudden irruption into the colony, above 20 years ago, was at once one of the many novelties, as well as one of the doubtful benefits resulting from the world-wide fame of the gold-fields, now number 18,000. The Germans are the only other foreign element of any noticeable strength. They began to arrive in 1849, Australia having become favorably known to them by a considerable preceding emigration to Adelaide. They have proved, on the whole, an advantageous immigration, for although slow to adapt traditional usages to their new circumstances, they have set a commendable, and often a much-needed example of frugality, industry, and sobriety. The various divisions of the United Kingdom contribute somewhat rateably their quota to the colonial population. The census of 1871 gave the numbers in connection with the various denominations as follows: Church of England, 267,835; Presbyterians, 112,958; Methodists, 18,191; Independents, 16,311; Roman Catholics, 170,620; Lutherans, 3540; Baptists, 10,569; Jews, 8571. There are in the colony 1232 churches and chapels, besides 825 school-houses, and 577 other buildings, also used for public worship.

Natives.—By the census of 1871, the aborigines were found to number 1338, con-

sisting of 990 males and 848 females. The number when the settlement began is usually stated to have been 6000, although probably much larger, seeing that Tasmania, only one-fourth of the extent, and with a climate less genial to savage life, is supposed to have contained 5000. But that is a point about which we can now only conjecture. The native is fast dying out from the colonised area. The progress of colonisation has been utter destruction to his prospects. Philanthropic and Christian efforts on his behalf have not been absolutely barren. Mission stations in Gipps' Land, conducted by the Church of England and the Presbyterian Church, have diffused the influences of civilisation and religion to a considerable portion of the survivors. These missions are under the immediate supervision of Moravians, and aim a little at the culture and preservation of the race, not without some evidences of success.

Commerce.—The two staple articles of export from the colony are wool and gold. The exportation of the former in the year 1875 was valued at £6,418,599; of the latter, at £3,090,696—in both cases a decrease as compared with the previous year. After the gold discoveries in 1851, there came an extraordinary commercial development. For that year, the imports had been £1,056,457, and the exports £1,422,909. In 1854, the amounts were respectively £17,659,061 and £11,775,204. But this sudden extension—at least as regarded imports—was not maintained, because it was due, in part, to a temporary extravagance, and partly because the colony has since then been successfully organising its industry, so as to produce fully as cheaply and as well many articles that were at first imported. For 1876 the imports were £16,705,353; the exports, £14,196,487. In 1875, the shipping entries amounted to 1,693,885 tons—namely, inwards, 840,386; outwards, 853,499. The gold production of V. has gradually diminished from £12,000,000, to which it rose in 1856, to a little over £4,000,000 in the year 1874. This diminution is partly made up to the world by the greatly increased gold-mining of late in New Zealand and New South Wales. The yearly production of all these colonies is now about £10,000,000, distributed thus: V. 5; New South Wales, 2; Queensland, $\frac{1}{2}$; New Zealand, $2\frac{1}{2}$. The greater part of this gold is usually sent direct to Britain, but the proportion is very irregular, depending on the state of the exchange with India. Thus, while in 1865, £5,051,170 was received in England, in 1864 it was only £2,656,971, and the year before it was £5,995,868. The total of Australian and New Zealand wool received in 1871 amounted in value to the sum of £10,845,930. The exportation of articles, the produce of this country, to V. amounted for 1874 to the value of £6,959,260, and for all the others of these colonies to £9,852,690, making a total of £16,791,890. The chief articles of this exportation are apparel and "slops" (i. e., ready-made clothing), boots and shoes, haberdashery, cottons, woollens and worsteds, and iron in various stages.

The chief colonial vocations are squatting, or pastoral pursuits, agriculture, and latterly gold-mining. The first mentioned was the earliest that rose to importance; but the last has rapidly outvalued every other. Agriculture, at first dwarfed by the success and influence of squatting, and for a time impeded afresh by the social upturning during the first years of gold-mining, is now, however, rapidly extending, and is improving, socially as well as physically, the aspect of the country.

Squatting.—This colonial term has long since passed from its originally semi-savage and outcast associations, to represent in Australia a rural aristocracy. The squatter, using the country just as he found it, placed upon it his live-stock, which lived and thrived on the natural herbage. This ready adaptation of the surface, with comparatively little of preliminary outlay, is the chief cause of Australia's rapid progress. At first, the pastoral "stations," or "runs," as they were then very appropriately called, were unenclosed areas, parcelled out to a small number with a very bountiful hand, and at a nominal rent or occupation license-fee. Now, however, these areas have been much subdivided, and much has been done in enclosing the runs with stout fencing. By a late official return, there were in V. 1166 different stations, comprising an area of 81,875,468 acres, and contributing to the revenue a yearly rental of £228,118, 17s. 7d. The rate is from $\frac{1}{4}$ d. up to 8d. per acre, according to a valuation of pastoral capability. The number of sheep in the colony in 1879 was 10,002,851; of cattle, 799,509; and of horses, 181,643.

Agriculture.—Comparatively little was accomplished in this branch for 25 years, until 1860, when the government began to increase the facilities for acquiring and cultivating the public lands. In 1861, there were but 180,000 acres under

the plough; in 1876, the area had increased to 971,997 acres, including 831,401 acres in wheat, and 124,100 in oats. The yield of the various crops was—wheat, 4,978,914 bushels; oats, 3,719,795 bushels; barley, 760,655 bushels, &c. The grain crops for 1876 shew an increase over those of 1875 to the amount of 957,917 bushels. The dry climate of Southern Australia seems favorable to the quality of wheat; and the Victorian samples at the Great Exhibition of 1869 ranked amongst the very best. The wine-produce for 1876 was 755,000 gallons. Vine-culture rapidly extends, and wine-making is now general, with a large consumption in the interior districts, and periodical public sales of the vintages.

Gold-mining.—This may now be termed one of the skilled labors of the colony; but it is not by any means, on an average, among the most remunerative. Of the two great branches of mining—viz. (1), the crushing of the auriferous rock for the washing out of the gold, and (2) the washing from the debris or "drifts" which nature has already pounded down ready to the miner's use—the latter, as embracing the simpler process, was at first the most general, but more lately the other has been increasingly followed. By means of improved machinery, quartz-crushing has become a comparatively regular and sure source of living.

Railways.—The system is more extensive and complete than in any of the other southern colonies. At the end of 1876 there were 702 miles of railway open for traffic, and 259 miles in construction.

Finances.—The public revenue is derived mainly from three different sources—customs dues, land sales and rents, and public works. The total revenue of V. for the year 1870—1871 amounted to £3,261,833. The chief items were—customs, £1,318,974; land-sales, £367,565; public works (chiefly railway receipts), £643,451. The revenue for 1875—1876 amounted to £4,523,605. The income is generally ample for all expenses. The outstanding public debt amounted in June 1876 to £14,256,000. About 7-8ths of this amount represents the cost of the railway system now completed, and traversing the colony from Port Phillip to the river Murray. The remainder is the cost of water-supply to Melbourne and other parts of the colony, and of aids to Melbourne and Geelong for town improvements. This debt exists in the form of debentures, nearly all bearing interest at 6 per cent., and due at various terms up to 1891. These debentures are nearly all, excepting about one million, held in this country, and are well known in the London market, the chief stock being "The Railway Loan" of £7,000,000.

Taxation, according to the revenue accounts, amounts to a little over £5 per head. Deducting, however, the revenue from railways and from the sales of land, the amount per head is reduced by one-half, bringing it to about the same as in this country, although more equally distributed, owing to the greater equality of condition among the colonists, and more equal consumption of articles subject to customs dues. The customs revenue is derived mainly from strong drinks and tobacco. There are also moderate duties on sugar, tea, and coffee, and various other articles. Municipal and road-district taxation are additional.

Political Institutions.—The self-government conceded to V. and the adjacent colonies gives them a responsible system similar to our own. The governor represents the sovereign who appoints him; and he governs by ministries who are of the crown's, that is, of the governor's nomination, but who must possess the confidence of parliament. There are two houses of legislation, both in V. being elective—the Council or Upper House by a high and special qualification; the Assembly by manhood suffrage, without any qualification for members. Elections are by secret ballot. The term of the governorship is usually seven years. The present salary of the office in V. is £10,000 a year; and in the expensive times more immediately succeeding the gold discoveries, it was £15,000. Judged by the criterion of salary, the Victorian appointment is the most important of the colonial list, excepting the governor-generalship of Canada (which is of the same value), and the governor-generalship of India. The salary is paid wholly by the colony; but by a recent imperial act, the home government allows moderate pensions to retired governors, according to the term of service—a measure that had been called for in face of occasional reverses of fortune to the later life of persons who had previously represented royal splendor.

Religion.—The divergence of our self-governed colonies from home example is

perhaps most striking in two very important subjects—religion and education. In religion, as in politics, the tendencies are towards a complete equality, and therefore opposed to the privileges involved in church establishments. In this respect, change of scene, and equality and independence of condition, sensibly weaken the strength of tradition and usage as exhibited in the senior country. All religious bodies, therefore, stand alike before the civil power, none having any coercive jurisdiction except such as its own members voluntarily impose upon themselves, either by their own rules, or by a special act solicited from the colonial legislature. In V., until lately, there was a yearly dotation of £50,000 from the public revenue to the support of religion. It was distributed rateably among the sects, Unitarians and Jews included, and was “scheduled”—i. e., not subject to yearly vote—under the Constitution Act. This system, introduced into Australia as a substitution for the preceding Church of England supremacy, terminated in 1875. Lately, the public feeling had tended to a disapproval of the system of indiscriminate support to religion, and some of the smaller bodies had altogether rejected it. The state aid was therefore abolished in some of the colonies. In V., the Assembly had repeatedly passed an abolition act, which, however, the Council negatived. Ultimately, a few years ago, a bill passed both Houses, whereby the grant in aid to religion wholly ceased in 1875.

Education.—The energy displayed on this subject by the popular administrations of our self-governed colonies, and the tenacious persistence with which they encounter the problem of the education of the whole people, are among the best results presented to us by these young offshoots. Under the preliminary “imperial régime” of colonial public life, the comparatively neglected field as to education is taken up, and with creditable zeal, by the various clergy, who institute, of course, the denominational system. But essential difficulties stand in the way of the successful importation of a general education under this system. A national system, to compete with the previously established denominational, had been introduced into New South Wales and V. with the advent of the partially representative legislatures that for about twelve years preceded the present self-government. National and denominational, each conducted by a separate board of management, were alike aided by the state. The institution of a partially national system, and of a single board, was carried in the Victorian legislature in 1862. That system was, in effect, that all state-assisted schools must be open to the children of all religious bodies, and that four hours daily of secular teaching be imparted to every pupil. This arrangement, on experiment, was unsuccessful. Schools still remained in connection with the several denominations; denominational school committees controlled the election of teachers, who were also permitted to impart religious instruction where desired. As a result, schools were unnecessarily multiplied in some localities, and the money of the state was wasted in their support. After various attempts to establish a system of state schools unconnected with any denomination—attempts which several of the religious bodies combined to defeat—the Victorian government at last succeeded in overcoming all difficulties, and a bill passed both Houses of the Legislature, which completely establishes a national, as opposed to a denominational system of education. The total number of public schools in V. is (1876) 1111, with an attendance of 104,375; 896 private schools, with 22,156 scholars; besides 5 grammar schools, various colleges, and the Melbourne University.

Remarks to Emigrants.—Intending emigrants should understand that V. is no longer a new and scantily-peopled territory, with all the superabundant employment and means of subsistence that are readily found now-a-days on such a scene by help of the arts and implements of an advanced civilisation. There are now in the colony the advantages of a settled society, having much of the amenities of home-life; but, on the other hand, the colonial vocations are tolerably filled up by the increasing population, so that the nascent or the inexperienced have hardly any better chance out there than at home. It is owing to considerations of this kind that the system of free or assisted emigration—a system still maintained to a limited extent by the colony—has been latterly conducted upon very strict principles; the object being, that persons unsuitable to the colony may, as far as possible, be prevented from going there. The system of granting free passages has, on the whole, been recently discouraged by the legislature and government of V., where the influx of

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the home poor is dreaded. Both free and assisted emigration is for the present wholly suspended. Laborers, mechanics, and artisans need to obtain assisted passages by what are known as passage-warrants, issued to residents in the colony, on making the following payments to the colonial government: For each male under 15 years of age, £4; between 15 and 40, £3; above 40, £2; for each female under 15, £3; between 15 and 40, £4; above 40, £5. The warrants, available for nine months after issue, had to be forwarded to the emigration agent of the Victorian government, to whom female domestic servants, desirous of emigrating to V., should likewise apply; they are in great demand there, and have high wages. Steady-going working-men, agricultural and farm laborers, in particular, are in request, and are sure to do well. Self-reliance, steadiness, and good conduct are essential requisites to success in all the colonies; with these, no working-man of the special classes referred to can fail to better his position, and add to the comforts and happiness of life. There is special encouragement to female emigration. As a general rule in V., at present, wages and remuneration generally are one-third or one-fourth higher than in this country; while the chief requirements of life are, one with another, at about the same price as they are here. House-rent is rather higher, while butchery-meat is cheaper, and other necessities about equal. The climate is, as a whole, highly enjoyable with its bright skies and sunshine; but to working-men, six months of the year (from the middle of October to the middle of April) will be found somewhat oppressive for great physical toil—a consideration no doubt present to the working-classes of the colony in connection with their successful introduction of an eight-hours' labor system. There are now more facilities than the colony formerly enjoyed for acquiring land at a reasonable price; and the climate has been found quite suitable for the cultivation of all the cereal crops of this country, as well as the grape and other fruits, the gift of a temperature more genial than that of England.

VICTORIA, a town in Vancouver's Island, capital of the province British Columbia, in the Dominion of Canada, stands at the south-east extremity of the island. The entrance to the harbor is shoaly, narrow, and intricate, and at no state of the tide can admit vessels of over 17 feet draught. V. was originally a trading establishment or fort of the Hudson Bay Company, and has risen into importance only within recent years, when gold was first discovered in British Columbia. It is a free port; and considerable commerce is carried on. Pop. about 5000. See VANCOUVER'S ISLAND.

VICTORIA, a seaport of Brazil, capital of the province of Espirito Santo, stands on a bay of that name, 270 miles north-east of Rio de Janeiro. It has a good harbor, an active coasting-trade, and about 6000 inhabitants.

VICTORIA, a genus of plants of the natural order *Nymphæaceæ*, resembling the common water-lily, but most nearly allied to the genus *Euryale*, and distinguished from it particularly by the deciduous tips of the calyx, and the sterility of the innermost stamens. Only one species is yet known, *V. regia*. This is said to have been first observed by Hänke, about 1801, and afterwards to have been seen by Bonpland, D'Orbigny, and others. It was first described in 1832 by Pöppig, who observed it in the river Amazon; and it has since been found by Schomburgk and others in many rivers of the north-east of South America. Its leaves are orbicular, float upon the water, and attain a diameter of 5–6 feet; have the margin turned up, and about two inches high; are of a purplish color on the under side, and there exhibit a sort of wicker-work of very prominent veins, furnished with prickles. The flowers rise amongst the leaves upon prickly stalks. They are more than a foot in diameter, white, internally rose-colored, and are very fragrant. The fruit is a capsule, almost globose, with a depression on the top, about half the size of a man's head, fleshy within, and divided into numerous cells, full of round farinaceous seeds, which are an agreeable article of food. The plant is therefore called *Mais del Agua*, or Water Maize, in some parts of South America. To the cultivation of this plant, special hothouses have been devoted in some places in Britain, and elsewhere in Europe. It has been introduced into India from seeds produced in England.

VICTORIA BRIDGE, across the St Lawrence at Montreal, on the Grand Trunk Railway of Canada. This, the greatest tubular bridge in the world, was begun in May 1854, and finished in December 1859. The engineers were Robert Stephenson

and Alexander M. Ross. The dimensions and other particulars are stated in the article TUBULAR BRIDGE.

VICTORIA CROSS. See CROSS, VICTORIA.

VICTORIA LAKE, called also ALEXANDRINA or KAYINGA LAKE, a brackish lagoon in the south-east of South Australia, is separated from the sea only by a narrow belt. It receives the rivers Murray, Bremer, Angus, and Finnis, and communicates with the sea by a narrow passage that leads into Encounter Bay. It is 30 miles long, and about 12 miles broad. A sand-bar at the entrance to the lake impedes access for vessels from the sea; but the interior navigation is safe.

VICTORIA-N'YANZA. See N'YANZA.

VICU'GNA (*Archenia Vicugna*), a species of the same genus with the lama and alpaca. It is a more beautiful animal than any of its congeners. In size, it is intermediate between the lama and the alpaca. Its neck is longer and more slender than theirs; its wool is also finer, short, and curled. It is of a rich brown color, with patches of white across the shoulders, and the inner side of the legs. The V. inhabits the most desolate parts of the Cordillera, at great elevations; and delights in a kind of grass, the Ychu (*Stipa Ychu*), which abounds there in moist places; but it seldom ventures to the rocky summits, for which its tender feet are ill adapted. It is commonly found in small herds of from 6 to 15 females with one male. When the females are quietly grazing, the male stands apart, and carefully keeps guard, giving notice of danger by a kind of whistling sound, and a quick movement of foot. When the herd takes to flight, the male covers their retreat, often pausing to observe the motions of the enemy. If he is wounded or killed, the females gather round him, and will suffer themselves to be captured or killed, rather than desert him. The V. is a very active animal, like the wild goat or the antelope. The Indians seldom kill it with firearms, but set up a circle of stakes, about a mile in circumference, into which the vicuñas are driven.—A hybrid has been produced between the V. and the alpaca, which has a black and white fleece of long wool, resembling the richest silk.

VIDOCQ, François-Jules, who acquired notoriety as a detective-officer of police at Paris, was born on 23d July 1775, at Arras, where his father was a baker. On the principle of set a thief to catch a thief, his earlier life may be regarded as an almost invaluable apprenticeship to the profession in which he afterwards became distinguished. As a boy, he was employed in his father's shop, the till of which, it was found, he persistently robbed. To cure him of this evil habit, he was sent to the house of correction; but so little were his morals improved there, that he signalled his return to business by decamping with a sum of about £30. Of this money, a sharper relieved him at Ostend; and in order to keep himself in life, he engaged himself to sweep the cages of a travelling menagerie. From this menial service he was advanced to the post of tumbler and acrobat; and a further promotion was intended him to that of a supposed savage, whose performance involved the eating of raw flesh, and drinking greedily of blood. As he saw fit to decline the appointment, his further services were dispensed with; and shortly after, he returned to his father. Having entered the army, he attained the rank of corporal, and served with some credit in Belgium and elsewhere, till a wound obliged him to return home. For some years after, he seems to have lived as a scoundrel at large, occupying himself in swindling and disreputable love-affairs. In 1796, he turned up in Paris, and being detected in forgery, he was sentenced to pass eight years as a galley-slave. Before his term of durance had expired, he found means to escape, and became one of a band of highwaymen. As the story goes, his new associates, on chancing to discover that he was an escaped galley-slave, saw fit to decline his further acquaintance. This refinement of squeamishness on the part of these gentlemen of the road, seems not in itself very probable; but on whatever ground of dislike, they desired to rid themselves of M. V., and summarily did so, exacting from him a solemn oath not to betray them. M. V. took the oath very solemnly, and instantly proceeded to deliver the whole gang into the hands of the authorities. This pretty exploit seems to have suggested to him the rôle which he afterwards developed with such consummate success. Having to Paris, he offered his services to the authorities there as a spy upon the criminal classes. His advances were at first coolly received; but gradually he made his way; and shortly his services

became so important that official recognition was vouchsafed him. In 1812, a "Brigade de Sûreté" was organised, with V. as chief. Consisting at first of only 4 men, by degrees it was enlarged till it came to include 28; and its efficiency was something marvellous. Suspicious, however, grew rife that V. was himself the originator of many of the burglaries he shewed himself so clever in hunting out, and even contrived to make a good thing of them. It does not appear that this charge was in any case clearly brought home to him; but M. V. being plainly the sort of person in whom any suggested blackguardism is rather more likely than not, it had every inherent probability. Guilty or not as he may have been, so strong was the popular feeling against him that, in 1825, it led to his being superseded. After his dismissal, he became a paper-manufacturer; and in 1834, established a Trade Protection Society, the object of which was to furnish confidential information as to parties whose credit might be dubious. In 1839, he published an Autobiography, a *rédaetion* of which he put forth in 1844 (Engène Sue's famous novel having just taken the public by storm), under the title of "Les Vrais Mystères de Paris." Finally, he died in Belgium in the year 1850.

VIE'NNA (Ger. *Wien*, Lat. *Vindobona*, afterwards *Favianæ*), capital of the Austrian empire, stands on a plain at the foot of the last hills of the *Wiener Wald*, which forms the eastern extremity of the Alps. East of it extends a vast plain, as far as the eye can see, away to the Carpathians, which are visible on a clear day in the distance. On the north, the hills approach within half-a-dozen miles of the city, and extend uninterruptedly, to the west, to the Tyrolean Alps. An arm of the Danube (called a canal) passes along the north-east side of the city, and separates it from the suburb of Leopoldstadt. Into this arm flows the font and (when not swollen by rains) insignificant stream, called the *Wien*, from which the city takes its name. V. consists of the old city or inner town, called the *Stadt*, with narrow and irregular streets, and of a circle of suburbs, nine in number, completely surrounding it. Around the *Stadt*, and separating it from the suburbs, is a ring space upon which were formerly the fortifications, levelled in 1858. This space is now being rapidly covered with buildings, of which the principal form part of the Ringstrasse, a handsome boulevard, in many places 70 yards wide. Besides the internal fortifications just mentioned, there is an external ring with rampart and fosse, which is still preserved as the boundary of the city imposts. These fortifications are called the *Linies*, and at one time encircled both suburbs and city; the former are now, however, rapidly extending themselves outside. Unlike most other European cities, the old part of the city is the most fashionable. In the *Stadt* are the palaces of the emperor and of some of the principal nobility, many stately mansions, the public offices, the finest churches, most of the museums and public collections, the colleges, the exchange, and the best shops. Since the erection of the Ringstrasse and other buildings upon the site of the old glacis, however, very many of the aristocracy have gone there to live. The suburbs are laid out in wide streets, many of which, being unpaved, are extremely dusty in summer, and very muddy in winter. As a rule, the houses are let in "flats," almost the only exception to this being the palaces of the higher nobility; and in some cases even these consist only of the two lower stories of the building. Among the principal squares are the *Josephplatz* and the *Burghof* (the latter the court of the palace); the outer *Burgplatz*, which is laid out with grass and flowers, and in which stands the *Burgtor*; the *Neuer Markt, am Hof*, and *Freiung*. The latter three are in the heart of the city, contain many picturesque buildings, and are otherwise interesting, standing as they do in much the same relation to V. as the Grassmarket to Edinburgh. V. is the see of an archbishop; and the chief of its many churches is the cathedral of St Stephens. This church is 354 feet long, 229 feet broad, and 80 feet high, and has a very beautiful tower, 450 feet high, erected in 1860-1864, to replace the former structure, which was removed because of its unsafe condition. Its different parts have been built at many different periods, the choir having been commenced in 1559, while the nave dates a century later. The church of the Augustines is remarkable for its monument of the Archduchess Christina of Saxe-Teschen, one of the most successful works of Canova. The most beautiful church in V., and one of the most beautiful in the whole of Germany, is the *Votiv-Kirche*, built in commemoration of the emperor's escape from assassination in 1853. It is a Gothic church, not completely finished till 1878, with two towers and spires, and covered with deli-

cate and beautiful tracery and carving. The Imperial Royal Palace is an ancient building, consisting of various parts, erected at different times. Adjoining the Palace, or forming part of it, are the Imperial Library (410,000 vols.—13,000 printed before 1500—and 30,000 manuscripts), the Treasury, the Cabinet of Coins and Antiquities, &c. Among the other collections of interest are the Belvedere, including the Ambras collection (pictures, sculptures, and antiquities); the Arsenal; the Liechtenstein Gallery, and Count Harrach's collection (pictures), and the Albertina (drawings and engravings), the latter containing the original study of Raphael's "Transfiguration." The Polytechnic Institution (for instruction in practical science, &c.) is attended by about 1000 pupils, and in connection with it there is a capital technological museum. The University (founded 1365) has upwards of 3900 students on its roll, a staff of over 200 professors and lecturers, and a library of 212,000 vols. As a school of medicine, it is celebrated all over the continent. The principal places of public resort for the lower classes are the gardens of the palace at Schönbrunn, the *Augarten* and the *Prater*, the latter being probably the largest park in Europe. The buildings of the great exhibition of 1873 were in it. The nave of this immense exhibition was 2963 feet long, and in the centre of it was a great rotunda, designed by Mr Scott Russell, 344 feet diameter. Only this rotunda, and a part of the buildings immediately connected with it, are to remain standing permanently. Although possessing many points of interest, especially in its Eastern exhibits, the exhibition did not succeed financially. V. contains eight or nine theatres, of which the best three, including the magnificent opera-house, are in the *Stadt*. The manufacture of silk-stuffs, and also shawl-weaving, are important branches of Viennese industry. The manufacture of meerschaum pipes, gloves, and all kinds of fancy leather articles, is also carried on greatly. Very extensive works are at present in progress to bring the Danube close to the city, and improve its navigation. When these are completed, a new suburb will spring up to the north-east, and V. will be in many ways very much altered. Pop. (1875) of V. and suburbs proper, about 850,000; but including the outlying villages (as e. g., Fünfhaus, Döbling, &c.), in which many well-to-do Viennese reside, the population is a little over a million.

VIENNA, Treaties, &c., of. This capital, from its central position, and from the prominent part which Austria has always taken in the wars of modern Europe, has been oftener selected than any other city (Paris perhaps excepted) as the meeting place of the representatives of the various European nations. The first treaty of V. (April 30, 1725) was a mutual guarantee of their dominions by the Emperor Charles VI. and Philip V. of Spain; besides which, the former agreed to aid in the recovery of Gibraltar from Britain, and to aid the Pretender in supplanting George I., in consideration of the latter guaranteeing the Pragmatic Sanction. The second treaty (March 16, 1731) was a joint guarantee of the Pragmatic Sanction by George II. of Britain and the States of Holland. The third (November 18, 1735) was a similar guarantee by Louis XV. of France, in consideration of the reversion of Lorraine and Bar (to be given meantime to Stanislas, the ex-king of Poland), as well as a settlement of the Polish succession dispute, and a rearrangement of the possessions of Austria, Spain, and Sardinia, in Italy. The fourth treaty (October 14, 1809) was concluded between France and Austria, after the battle of Wagram, and the armistice of Znaim, by which the latter agreed to resign some districts on the western border of the archduchy to Bavaria; Goritz, Friuli, Trieste, Carniola, and parts of Croatia, Carinthia, and Dalmatia, to France, these provinces to be formed into the government-general of Illyria; some districts of Upper Lusatia to the king of Saxony; Western Galicia, with Cracow and Zamocz, and a share in the salt mines of Wieliczka, to the grand duchy of Warsaw; and the eastern corner of Galicia to Russia: a total loss to Austria of 63,170 sq. m., with a pop. of 3,500,000, and all her seaports.

The next, and by far the most important meeting of the representatives of European nations, was the *Congress of Vienna*, which was held here after the first treaty of Paris, for the general settlement of the affairs of Europe. The congress, which first met on September 30, 1814, was composed of the Czar Alexander I. of Russia, with Count Nesselrode; the king of Prussia, with Hardenberg; Lord Castlereagh, and afterwards the Duke of Wellington, as representatives of Britain; Prince Metternich for Austria; Count Talleyrand for France; as well as representatives of Spain, Portugal, Sweden, Rome, Germany, and all the other minor powers, who were interested personally in the deliberations: the total number of those who as-

sisted at the congress being about 500. But the representatives of the minor states, who had expected a species of European parliament, to which all would be admitted, were sadly disappointed by the preliminary resolution of the great powers to constitute two committees, one of which would deliberate on the affairs of Germany; and the other, composed only of the representatives of Austria, Prussia, Russia, and Britain, would discuss the affairs of Europe generally, decide respecting the partition of the conquered districts (formerly belonging to France and her allies), and the frontier of each European sovereignty. To this latter council, Talleyrand, by the influence of Castlereagh, who early saw the necessity of a counterpoise to the influence of Russia and her follower, Prussia, in the conference, was admitted (October 5); and three days after, it was increased by the representatives of Spain, Sweden, and Portugal. The first resolution of the European committee, to rearrange Europe so as to leave the parties directly interested nothing more to do than give their adhesion to the arrangements made for them, being an arrogation of sovereignty over all Europe, was loudly exclaimed against; but the congress was one of rulers and *their* representatives, and not of the nations and *their* representatives, so the indignant clamor which rose on all sides was quite unheeded. The points which were at once and unanimously settled were—the constitution of Belgium and Holland into one kingdom (*the kingdom of the Netherlands*); the annexation of Norway to Sweden; the restoration of Hanover, with a large slice of Westphalia, to the king of Great Britain; of Lombardy to Austria; and of Savoy to Piedmont. But the questions as to the disposal of Poland, Saxony, and Genoa were not so easily settled. Russia and Prussia, overweeningly vain of the prominent share they had had in crushing Napoleon, were bent on aggrandisement of the most extravagant sort; the former loudly insisting on obtaining the whole of the grand duchy of Warsaw (see *POLAND*); while nothing less than the whole of Saxony, and some of the trans-Rhenish provinces of Westphalia, would satisfy the latter; and both significantly hinted at the proximity of their colossal armies, with the view of awing the other powers into compliance. But Castlereagh was not the man to be so influenced; and while steadily refusing to yield an iota to such preposterous pretensions, he joined with Metternich and Talleyrand in a secret treaty, offensive and defensive, February 8, 1815; which was cordially acceded to by Hanover, Sardinia, Holland, and Bavaria. The news of this agreement soon leaked out, and produced a considerable modification in the pretensions of the northern powers. At last it was agreed that Prussia should obtain a portion of Saxony (now Prussian Saxony), Posen, Cleves, Berg, the greater part of the left bank of the Rhine as far as the Saar, and Swedish Pomerania; and cede East Friesland, Hildesheim, &c. to Hanover, Anspach and Baireuth to Bavaria, and Lauenburg to Denmark; while, with the exception of Posen, Thorn, and those parts of the grand duchy which had been (1809) taken from Austria, Poland was to be erected into a kingdom separate from Russia, but under the rule of the czar. Austria recovered the cessions which she was forced to make in 1809, obtained also the Valtelline from Switzerland, and the establishment of collateral Hapsburg lines in Tuscany and Plombino; while Maria-Louise obtained Parma. The pope was replaced in his former position as a temporal sovereign; the ancient constitution of Switzerland re-established; and Genoa—despite the strongly expressed aversion of its inhabitants—incorporated with Sardinia. The news of Napoleon's return from Elba somewhat hurried the conclusion of these multifarious arrangements, yet the negotiations were not interrupted; Metternich's scheme for a new confederation of the German states (the same which has continued till 1866) was unanimously agreed to, the question of mutual indemnities, rectifications of frontier, &c., being subsequently settled (July 20, 1815, at Frankfurt, by a territorial commission composed of representatives of the four great powers. The questions of the slave-trade and of the free navigation of the Rhine and its tributaries, were brought up by England, and also satisfactorily settled. Finally, a formal treaty (*the fifth treaty of Vienna*) was drawn up and signed, June 9, 1815.

VIENNA PASTE is a preparation which is extensively used as an encaustic, although it is not contained in the Pharmacopœia. A mixture termed *Potassa caustica cum calce* (Caustic potash with lime), which is itself a caustic, and is much employed for producing issues, is first prepared by mixing equal weights of caustic potash and freshly-burned lime in a warm mortar, and rubbing them to a powder, which should at once be placed in an air-tight bottle. The caustic powder of which

Vienna paste is made is obtained by similarly mixing 50 parts of the preceding compound with 60 of quick-lime. It must be kept in a well-stoppered bottle; and when required for use, the powder is made into a soft paste with a little spirit, and applied to the part it is desired to cauterise. It is much employed by some physicians in certain affections of the womb; and is one of the best applications to an indurated chancre. See SYPHILIS.

VIENNE, an interior dep. in the west of France, bounded on the n. by the depts. Maine-et-Loire and Indre-et-Loire, and on the w. by Deux-Sèvres, which intervenes between this and the maritime dep. of Vendée. Area, 2650 sq. m.; pop. (1876) 330,916. The Vienne, an affluent of the Loire, is the principal river, and all the other streams of the dep. are tributary to it. It flows from south to north, and receives the Clain, Gartempe, and Creuse—of these, the last only is navigable. The surface is flat, with a gradual slope toward the north. The country consists almost wholly of fertile plains, fine pasture-lands, and extensive forests. The climate is soft, temperate, and healthy. Grain is cultivated in greater quantity than is required for local consumption. On an average, 13,200,000 gallons of wine are produced annually. In general, however, agriculture is in a backward state. The mineral riches of the department consist principally of iron and manganese, and numerous quarries of building and other stones, including lithographic stones, which are finer and harder than those of Munich. The dep. is divided into the five arrondissements of Poitiers, Châtellerault, Clivray, Loudun, Montmorillon. Poitiers is capital.

VIENNE, one of the most ancient towns of France, in the dep. of Isère, on the left bank of the Rhone, 19 miles south of Lyon by railway. The river Gère passes through the town, and here joins the Rhone, after having supplied motive-power to a number of mills and factories. V. was the chief town of the Allobroges, is mentioned by Cæsar ("De Bello Gallico," vii. 9), and by Martial, who terms it *opulenta Vienna*. At the time of the Roman emperors, it was the rival of Lyon. Besides numerous water-conduits, &c., of Roman construction, there is a temple supposed to have been dedicated to Augustus, and which is now used as a museum, and contains a number of ancient Roman remains. There are also a Roman arch, remains of a theatre, and an obelisk, called L'Aiguille, 72 feet high; and the cathedral of St Maurice, a stately Gothic edifice, with much delicate carving. Manufactures of coarse woollens are carried on; and there is a good trade in wine. Pop. (1876) 22,960. In 1312, a council was held here, in which Pope Clement V. pronounced the suppression of the order of the Templars.

VIENNE, Haute, an interior dep. of France, bounded on the west by the depts. of Vienne, Charente, and Dordogne; area, 2180 sq. miles; pop. (1876) 534,061. It is watered by the Vienne and its tributaries—the chief of which is the Gartempe. The surface is for the most part level; but traversed by ranges of low hills, of which the Monts du Limousin, which traverse the south of the dep. from east to west, rise in their highest summit to 3000 feet. The Mont de Puy-Vieux, the highest in the dep., is 2900 feet above sea-level. The climate is cold, humid, and frequently foggy. The soil is not fertile, and agriculture is in a very backward condition. There are, however, extensive meadows, and the domestic animals are reared in great numbers. Mines of iron, lead, and copper are worked. The dep. is divided into four arrondissements—Limoges, Bellac, Rochechouart, and Saint-Yrieix; capital, Limoges.

VIE'ESSEN, a prosperous and beautiful manufacturing town of Rhenish Prussia, 18 miles west of Düsseldorf. V. has extensive manufactures of woollen and flax, as also of woollen, damask, silk and velvet stuffs, and ribbons; there are also dye-works and many other industries, which give employment to thousands of workmen. The population of V. has more than doubled itself within the last few years, being in 1871, 18,474.

VIERZON-VILLE, an ancient and handsome town of France, in the dep. of Cher, 43 miles south of Orleans. V. has blast furnaces, forges, and steel refineries, manufactures of porcelain and earthenware, and a trade in cereals and wine. Pop. (1872) 8376.

VIETA (otherwise given **VIET**, **VIETTE**, or **DE VIETTE**, and by himself Latinised into **VIETÆUS**), François, the most eminent French mathematician of the 16th c.,

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was born at Fontenai-le-Comte, near La Rochelle, in 1540. Of his early life and education we know nothing, and almost all our acquaintance with the details, meagre as they are, of his personal history, is derived from the records of his friend, De Thou (q. v.). V. was employed throughout his whole life in the service of the state under Henry III. and Henry IV., and devoted only his hours of leisure to the study of mathematics and other subjects—affording an excellent illustrative argument against the belief that abundant leisure is essential to high eminence, and in favor of the contradictory theory that mental work of whatever sort tends to prepare the mind for any other species of thought-labor. V. was a zealous Roman Catholic, and a strenuous supporter of the doctrine of the divine right of kings. His genius and persevering industry brought him prominently into notice on various occasions. During the war against the Spaulards, the latter, to preserve as much as possible their communications with their numerous outlying possessions, and prevent the French from profiting by information from intercepted letters, adopted a species of cipher (see CRYPTOGRAPHY) of more than 500 characters, each varying from time to time in its signification. Some specimens being intercepted, were submitted to V., who after a time discovered the key to the cipher, to the great discomfiture of the Spaniards, who, incapable of accounting for the discovery otherwise, attributed it to magic; though the story that V. was summoned to Rome to defend himself before the pope against the charge of having dealings with the devil may safely be regarded as untrue. V.'s next prominent appearance was as an assailant of the Gregorian calendar, in opposition to which he published (1600) a "true Gregorian calendar," which was with justice considered by his contemporaries as inferior to that which obtained the papal sanction. However, V. did not, or would not, see his error, and attacked the Jesuit Clavius, to whom the pope had intrusted the compilation of the calendar, in a bitterly abusive manner; displaying, however, such a mastery of knowledge, that one of Clavius' defenders was led to sympathise with the unfortunate Jesuit who had to withstand the assault of one who was at once a lawyer, theologian, mathematician, orator, and poet. V., however, is almost exclusively recognised by posterity as a mathematician; yet, though worthy to rank among the highest of this class, immediately after such men as Newton and Lagrange, the incessant state of politico-religious turmoil in which France was kept during his life, and the fact that all his works printed during his life were set up at his own expense, and distributed among his friends, have hitherto hindered a general recognition of his high merit. The Italian tabulators of the progress of mathematical science have thus had a good opportunity of decking out their national idols (Cardan, especially) with plumes stolen from the obscure French investigator. The claims of V., however, are now becoming more and more generally recognised. He is indisputably entitled to be considered as the creator of modern algebra, which he established on the footing of a purely symbolical science; he applied his algebra to the extension of trigonometry, discovering the relations of multiple angles; and he extended the ancient process of extracting square and cube roots to the solution of all equations, an extension which has been since modernised and modified, and now appears as *Horner's method*. Besides, he proved his superior mathematical powers, by solving problems which had puzzled Apollonius, Regiomontanus, &c.; and was acknowledged by the mathematicians of Belgium and Italy as their master. Yet, strange to say, his own countrymen, the French, have so little knowledge of the surpassing talents and achievements of V., that, omitting all intelligent mention of his peculiar successes, they ascribe to him praises due to his Italian predecessors, and to his great English successor, Newton. Most of V.'s works were collected by Schooten, and published by the Elsevirs, at Leyden, in 1646. Two other works of his have been recently discovered, the "Harmonicæ Cœlestæ" and the "Canon Mathematicus," the latter the first table in which trigonometrical functions of an angle are completely given. Of the first, two MSS. exist; while the second was printed and circulated according to V.'s usual fashion, and has long been a bibliographical curiosity; but neither has yet been published. See Knight's "Eug. Cyc.," art. "Vieta."

VIGAN, Le, a small, prettily situated town in the south of France, in the dep. of Gard, 45 miles west-north-west of Nîmes. It carries on a trade in wine, oil, mules, horses, and silk. Silk and cotton fabrics are manufactured; and hides are tanned, known as Vigan hides. Pop. (1876) 4340.

VIGEVANO, a town of Northern Italy, in the province of Pavia, 15 miles south-east of the town of Novara. It stands on a rising ground on the banks of the MORA, not far from the Ticino. It manufactures silk, linen, and cotton fabrics, and has an active trade in grain and wine. Pop. 18,000.

VIGIL (Lat. *vigilia*, Fr. *vigile*, I watch), a preparatory time of devotion, which, by a very ancient Christian usage, went before the more solemn festivals, and especially Christmas, Easter, Pentecost, and the principal martyrs' days. In English, it was called "Eve" or "Even," a name which is still retained in relation to several festivals, as Christmas Eve, Hallow-even, &c. The observance is traceable in the very earliest centuries, and was established everywhere in the 4th and 5th centuries. It is one of the usages of his time against which Vigilantius inveighs, and which Jerome vindicates in his celebrated "Letter against Vigilantius." On the day before the great festivals, which seems from the first to have been held as a fast-day, the people assembled in great multitudes. The services proper to the vigil, but having a certain bearing on the coming festival, were celebrated; the night was spent chiefly in the church and in prayer, and other devotional exercises; but abuses arose out of these night-watches, which led to their suppression, as well as to the abolition of certain festivities which grew up in connection either with the vigil or with the feast itself. The observance of vigils is still retained in the Roman Catholic Church, and with it all the ecclesiastical offices, together with the fast, at least in the great vigils of Christmas, Easter, Pentecost, Saints Peter and Paul, Assumption, All-Saints, &c.; but all the other details of the celebration have gone into disuse. In the English Prayer-book, the "vigils or evens" of the chief festivals of our Lord, of the Blessed Virgin Mary, and of the Apostles are retained in the Calendar; but they have no special services appointed for them, nor any other celebration.—See Blunt's "Annotated Common Prayer," p. 28.

VIGNETTE (Fr. little vine, a tendril; Lat. *viticula*), a term originally applied to the flourishes in the form of vine tendrils, branches, and leaves with which the capitals in ancient manuscripts were often surrounded. Similar decorations were introduced into printed books, and all kinds of printers' ornaments, such as head and tail pieces, came to be designated as vignettes. More recently, the name has been applied to any small engraving (as on the title-page of a book), design, or even photograph, which is not circumscribed by a definite border.

VIGNY, Alfred, Comte de, a French poet and novelist, was born at Loches in Touraine, March 27, 1799, and educated at Paris. After spending some time as a soldier, he married, in 1826, a wealthy Englishwoman; and two years later, withdrew from the army, in order to devote himself exclusively to literature. He died September 18, 1863. V. belongs to the Romantic school, but is free from all their extravagance of style and sentiment. No modern French poet exhibits an equal refinement and delicacy. His principal works are "Poèmes" (1822), "Poèmes Antiques et Modernes" (1824—1826), among which are his famous "Moïse," "Dolorida," and "Elva;" "Cinq-Mars" (1826), a historical romance of the time of Louis XIII., which is much admired in France, and has gone through more than a dozen editions; "Stello ou les Diables Bleus" (1832); "Servitude" and "Grandeur Militaire" (1836)—two very striking and suggestive novels; "La Maréchale d'Aucre," and "Chatterton" (1833)—dramas of considerable merit. Besides these, he published "Consultations du Docteur Noir" (1856). A posthumous work appeared in 1864, entitled "Les Destinées, Poésies Philosophiques."

VIGO, an ancient town and seaport on the north-west coast of Spain, beautifully situated on a bay of the same name, about 35 miles north of Oporto. Its delicious climate renders it important as a medical station; and its position on the slopes of a hill, overlooking a charming bay, and forming the centre of a scene, oriental in its wealth of palm, orange-groves, flowers, and orchards, is likely to tell in its favor as a residence for the rich. Its old walls and gates; its winding, narrow streets; its houses, whitewashed, or colored red or green; the craft which frequent its harbor, and the picturesque dresses of the peasants, are delightful to the artist, as well as to the ordinary observer. The country in the vicinity is exceedingly rich, and fruits, corn, wine, and oil abound. The trade of the port—which is also a harbor of refuge—is increasing. About 2500 vessels, of 800,000 tons, enter and clear the port yearly. Pop. nearly 9000.

The Bay of Vigo has an inland sweep of 20 miles, and is 5 miles wide at its mouth. The town has frequently been attacked by the English: by Drake in 1585 and 1589; by the Duke of Ormond, Rooke, and Stanhope in 1702; and in 1719 by Lord Cobham.

VIHARA (which, in Sanscrit, means, "walking for pleasure or amusement") is, with the Buddhists (q. v.), the name of their temples and convents. Originally, it designated the hall or halls where Buddha S'ākya牟尼, and the priests by whom he was accompanied, used to meet; but when these halls gradually were converted into temples, the name of *Vihāra* was applied to them; and when, in time, the temples became the centre of a number of habitations in which the priests belonging to the temples resided, the whole monastic establishment was comprised under the same name. Properly, therefore, the *Vihāra* merely designates the Buddhistic temple, and it is generally used in this restricted sense. Such *Vihāras* are in Ceylon permanent structures, the walls being plastered, and the roof covered with tiles, even when the dwellings of the priests are mean and temporary. Near the entrance are frequently seen figures in relievo, representing the guardian deity of the temple. Surrounding the sanctum there is usually a narrow room, in which are images and palutings; and opposite the door of entrance there is another door, protected by a screen; and when this is withdrawn, an image of Buddha is seen, which occupies nearly the whole of the apartment, with a table or altar before it, upon which flowers are placed. The walls of the *Vihāra* are covered with palutings, and its stories generally illustrate some legend of Buddha's life. Some *Vihāras* are built upon rocks; others, and amongst these the most celebrated, are caves, in part natural, with excavations carried further into the rock. The Cave-temple at Dambulla is one of the most perfect *Vihāras* in Ceylon (see the description of it by Forbes in the "Ceylon Almanac," 1834). On the continent of India, the finest specimens are those at Ajunta, Ellora, Salsette, and Junir. Sometimes no land is attached to the *Vihāras*, but sometimes also they are rich in lands; and in the case of one of the *Vihāras* in Kandy, there is an area belonging to it, which, under the native government, was regarded as a sanctuary for malefactors.—See Lt. Spence Hardy, "Eastern Monachism," and the authorities quoted there (London, 1860).

VÍKING (plural **VIKINGS**), a name given to the piratical Northmen who infested the coasts of the British Islands and of France in the 8th, 9th, and 10th centuries. This word is quite unconnected with "king," being derived from the Scandinavian *vík*, a bay; and this class of marauders were so called because their ships put off, not like the king's ships, from the lawful harbor, but from the bay. See **NORMANS**.

VILKOMIR, a town of West Russia, in the government of Kovno, on the Swenta, 130 miles south-east of Riga. It was a flourishing town in the 13th c., and continued prosperous till the 17th c., when it began to decline, in consequence of the wars with Sweden, Russia (V. being at that time a Polish town), and the Cossacks. The town contains an ancient church of the 18th century. Flax is exported to Riga; but the trade is not extensive. Pop. (1867) 9908.

VÍLLA, a term now applied to detached suburban residences with about one acre or less ground attached to them. In the time of the Romans, the villa was a cluster of buildings in the country, forming a sort of private town, and containing in one the residences of the proprietor, farmer, and servants, and all the necessary offices and other accommodation for the cattle—the gardens, pleasure-grounds, &c. These villas were sometimes of enormous size, but they do not seem to have been built on any regular architectural plan, so as to produce an effect commensurate with their extent. The villa was divided into several parts, according to their uses: 1. The *Villa Urbana* was the portion in which the proprietor resided, and was laid out, as the name indicates, in a manner very similar to that of a town-house. The size and style of this part depended, of course, on the pleasure or quality of the master. It contained the eating-rooms, bed-chambers, baths, covered porticos, walks, and terraces. 2. The *Villa Rustica* was the portion set apart for the stabling, servants, &c., and the accommodation for the cattle. Its extent depended on the size of the farm and number of cattle. 3. The *Villa Fructuaria* was for the wine, oil, and other produce. The number of servants accommodated in a villa was very great. The livery-servants, along with the gardeners for the pleasure-grounds, comedians,

musicians, &c., belonged to the Villa Urbana. The *Villous* presided over the others, including the servants for tilling the land, the herdsmen, shepherds, goat-herds, swineherds, poulterers, &c. There were also frequently several artisans, kept constantly on the premises, such as smiths, carpenters, &c.

VILLA or Santa Maria Del Principe. See PUERTO PRINCIPE.

VILLAFRANCA, a small town of Northern Italy, in the province of Verona, and 9 miles south-west of the city of that name, on the left bank of the Tartaro. It was formerly a place of great strength; but it is now notable chiefly as the place where the treaty of peace between the emperors of France and Austria, which brought the Italian war of 1859 to a close, was signed June 11th of that year. Pop. (including the surrounding hamlets) 7500.

VILLAFRANCA DE PANADES (of the Bakers), a dull, backward town of Spain, in the province of Tarragona, in Catalonia, about 80 miles west-south-west of Barcelona. It contains some very early palaces of the kings of Aragon, not, however, of much interest. Pop about 5500. V., founded by Amilcar, was the earliest Carthaginian settlement in Catalonia.

VILLA-REAL, a town of Valencia, Spain, in the province of Castellon, and 5 miles south of the city of that name, about 8 miles distant from the Mediterranean shore. It has wide, straight streets, laid out at right angles to one another, and contains flour and oil mills, woollen factories, and brandy distilleries. Pop. 7750.

VILLA RICA, a city of Brazil, capital of the province of Minas Geraes, called also Ouro Preto (q. v.).

VILLARS, Charles-Louis-Hector, Duc de, Marshal of France, one of the most illustrious of the great captains of Louis XIV.'s time, was born at Moulins, in the dep. of Allier, 8th May 1653. Being of a noble family, his education, with a view to the military profession, was prosecuted at the college of Juilly, and he subsequently volunteered into the army which was employed in Holland; and having attracted Louis XIV.'s attention by his daring courage and striking elegance of figure, obtained a troop of horse in 1672, served for two years under Turenne in Germany, and after the battle of Seneffe, received a regiment of cavalry, when yet in his 21st year. After a further term of service under Luxembourg and Crequi, he returned to Paris with the reputation of being one of the most promising young officers of the time. During the next ten years (1678-1688), he was employed in diplomatic service, chiefly at the court of Bavaria. In 1688, Louvois appointed him commissary-general of cavalry; and in the war which immediately followed the league of Augsburg, placed him at the head of the cavalry in Flanders. He was subsequently distinguished in the campaigns on the Rhine and in Italy. From 1699 till 1701, he represented France at the court of Vienna, and watched with sleepless vigilance the tortuous policy of the Austrian ministers, foiling by his penetration their most promising schemes, till he came to be regarded personally with extreme dislike, was shunned by all the court (Prince Eugene excepted), and even his life threatened. On his return, he was employed in Italy under Villeroi; and after a brief period of service under Catharin, was for the first time (1702) raised to independent command, when he was sent to succor the Elector of Bavaria, who had taken up arms on the side of France. Towards the close of 1702, V. crossed the Rhine, defeated the Markgraf of Baden at Friedlingen, took Treves, Traerbach and Nancy; and early in the following year, again crossed the Rhine, traversed the almost impassable defiles of the Black Forest, and debouching from the mountains at Villingen, joined the Elector near Dillingen, on the 12th of May. His bold and well-conceived scheme for carrying the war into the enemy's country, by advancing upon Vienna, while so many Austrian troops were employed on the middle Rhine, in Italy, and against Ragotski in Hungary, was foiled by the stupid obstinacy of his colleague, the Elector; and after his skill and genius had been tasked to the utmost to keep the Austro-Germans under the Markgraf of Baden and Stirum at bay, and he had been relieved by the return of his ally (who had been soundly beaten by the Tyrolean mountaineers), he reopened his line of communication westward, and leaving Marsin in command, returned in disgust to France. He was next commissioned to put down the insurrection of the Camisards (q. v.), which had been zealously fostered, for strategic reasons, by English and Dutch agents. V.'s mainly modern-

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ation and soldierly frankness fairly won over Cavalier, the ablest of the insurgent leaders; and might, with his consummate military skill, have suppressed the insurrection. However, he was not allowed to manage matters for himself, and all he could do was to reduce the ferment to insignificant proportions. V. was then sent to watch over the north-eastern frontier, and took post on the heights of Fronsberg, when Marlborough advanced upon him with 110,000 men; but V. had shewn such skill and strategy in the selection and fortification of his position, and such wise self-control in remaining strictly on the defensive, that the great English hero declined to risk an attack, and retreated; upon which V. burst into Alsace, captured the enemies' reserves of supplies and artillery, and advanced to Rastadt and Stuttgart. The withdrawal of some of his troops to reinforce the north French army forced him to recross the Rhine; yet, with his small army, he, in 1708, completely foiled all the attempts of Prince Eugene to penetrate into France. In 1709, he was sent to oppose Marlborough in the north; but unfortunately, at the commencement of the battle of Malplaquet (q. v.), he was severely wounded, carried off the field insensible, and rendered unfit for service till the following year; and the reopening of his wound in the autumn of 1710 forced him again to resign the command. But in 1711, he returned to his post, headed the last army France could raise, and with it fell upon the British and Dutch under Albemarle, who were intrenched at D. snail (24th July 1712), carried their intrenchments sword in hand, and captured the most of them; he then turned upon Prince Eugene, and drove him under the walls of Brussels. This magnificent series of successes saved the national honor, and even life, of France, and brought about the peace of Rastadt (see UTRECHT), which V. signed as plenipotentiary, 6th May 1714. After the peace he became, at court, the principal adviser on military affairs and on questions of foreign policy; was a strong opponent of Law's financial measures; but through the intrigues of Fleury, lost favor at court. The outbreak of war in 1732, however, brought out the old hero from his retirement, and with the title of "Marshal-general of the Camps and Armies of France" he went to head the French army in the Milanese. The campaign of 1733-1734 shewed that the weight of years had left V.'s military genius and spirit untouched; but the ill-behavior of his ally, the king of Sardinia, determined him to solicit his recall; and he accordingly set out for France; but falling ill at Turin, he died there, 17th June 1734. V. was the last of the great military geniuses of the French monarchy, and was wholly free from the restless anxiety for *éclat* which detracts from the merits of so many of them. As a general, he possessed in a high degree rapidity of apprehension, skill in disposition, and promptitude (without precipitancy or rashness) in action. Humanity and sincerity, joined to thorough self-reliance, may be traced through the whole of his long and eventful life; and the two latter qualities occasionally exhibited themselves so prominently at court as to cause the "professional courtiers" of Louis XIV. to look askance upon him as a "rude and immodest" person. His Memoirs have been printed in Holland, and his Autobiography by Anquetil.

VILLARSIA, a genus of plants of the natural order *Gentianaceae*, the species of which are widely distributed over the world, and are either aquatic or marsh plants, with entire leaves and yellow flowers. *V. nymphaeoides* is a native of England, but rare. It is more common in many parts of Europe, from Denmark to the Mediterranean, and is very abundant in Holland, often covering large tracts of the canals with its beautiful flowers and leaves. It abounds in the south of Siberia. It is easily cultivated.

VILLEFRANCHE, a town of France, in the dep. of Aveyron, is seated on the river of that name, in a valley surrounded by hills, 85 miles north-east of Toulouse by railway. It contains many interesting houses of the 15th and 16th centuries, and, in the market-place, a large collegiate church, in the pointed Gothic style of that period, and carries on important manufactures of copper wares, of gray cloths, and packing. Ironworks and foundries are in operation. Pop. (1976) 7819.

VILLEFRANCHE-SUR-SAÔNE, a small, industrious town of France, in the dep. of Rhone, stands on the Morgon, an affluent of the Saône, 18 miles north of Lyon, on the Paris and Marseille Railway. It is surrounded by a district studded with charming country-seats, and consists chiefly of a handsome street a mile and a

quarter in length. Manufactures of cotton goods are carried on, and there is a great trade in wines, horses, cattle, hides, and cloth. Pcp. (1876) 11,994.

VILLEIN. See SEAR.

VILLEMAIN, Abel François, a distinguished French scholar and writer, was born at Paris, June 11, 1790, and educated at the Lycée Impérial (now the Lycée Louis-le-Grand). In 1810, he was appointed Extraordinary Professor of Rhetoric at the Lycée Charlemagne; and shortly after, Maître de Conférences de Littérature Française et de Versification Latine, at the Ecole Normale. During the years 1812—1816, three of his literary essays were crowned by the French Academy—the “Eloge de Montaigne,” “Avantages et Inconvénients de la Critique,” and “Eloge de Montesquieu.” In 1816, he was appointed to a chair of Modern History at the Sorbonne, as assistant to Guizot; but in the course of the same year, was transferred by Royer-Collard to the chair of Eloquence, which he held till 1826. In 1819, he published, in 2 vols., his “Histoire de Cromwell d’après les Mémoires du Temps et les Recueils Parlementaires”—a work written in a calm, liberal, and wise spirit. Louis XVIII. took notice of the author, and V. was induced to enter on a political career. The post assigned to him was rather a delicate one, that of Chef de l’Imprimerie et de la Librairie. Under the ministry of M. Decazes, he also held the office of Maître des Requêtes to the Council of State, and in 1820 was decorated with the Legion of Honor. Two years later, appeared his translation (with preliminary essay and notes) of the “Republic” of Cicero; and in 1825, a drama entitled “Lascaris, ou les Grecs du XV. Siècle,” and an “Essai sur l’Etat des Grecs depuis la Conquête Musulmane.” In 1827, having gradually passed over to the ranks of the liberal opposition, he was charged, along with Lacretelle et Chateaubriand, to draw up the petition addressed by the French Academy to Charles X. against the re-establishment of the censorship of the press! The result of this hardship was the loss of his appointment as Maître des Requêtes, and in consequence, a vast increase of his popularity as a lecturer at the Sorbonne. In the beginning of 1830, he was sent to the Chamber of Deputies by the electoral college of Evreux, took his seat among the liberal party, signed the famous address of the 221, and was altogether very prominent and active in those movements which brought about the constitutional monarchy of Louis Philippe. But he was too sober, unsympathetic, philosophical a politician, too much a *Doctrinaire* of the Guizot school, to be a favorite with the excitable masses, and he only sat in the Chamber for one year. In 1831, the king named him member of the Royal Council of Public Instruction, of which he became Vice-president in 1832. The same year witnessed his elevation to the peerage. V. held the portfolio of Public Instruction in the ministries of Soult (1839—1840) and Guizot (1840—1844); but his health failed under the immense labors of his department, and the impossibility of pleasing so many different parties—the Church, the University, the Reds, the Liberals, the Doctrinaires, and the king himself; and in consequence, he found it necessary to resign. Afterward, V. wisely devoted himself to literature alone. His principal works are: “Cours de Littérature Française,” “Tableau du XVIII. Siècle,” “Discours et Mélanges Littéraires” (1823), “Nouveaux Mélanges Historiques et Littéraires” (1827), “Études de Littérature Ancienne et Étrangère” (1846), “Tableau de l’Eloquence Chrétienne au IV. Siècle.” (2d ed. 1849), “Études d’Histoire Moderne” (1846), “Souvenirs Contemporains d’Histoire et de Littérature” (1856), “Choix d’Études sur la Littérature Contemporaine” (1867), “La Tribune Contemporaine, M. de Chateaubriand” (1867), “Essais sur le Génie de Pindare et sur la Poésie Lyrique” (1869); besides a vast number of Essays, Etudes, Discours, Notices, and Rapports, addressed to the French Academy, of which he was perpetual Secretary from 1832. V.’s elaborate “Histoire de Grégoire VII.” nearly finished at the time of his death, was published in 1872. V. died 8th May 1870.

VILLENA, a town of Spain, in the modern province of Alicante, and 87 miles north-west of the city of that name by railway. The streets are narrow and winding, and are overlooked by an old castle, which has an imposing appearance, owing chiefly to its elevated position. Around the town, the hills are clad with vines, and the country is fertile. A great fair, at which goods are sold to the value of £120,000, takes place here every autumn. Pop. 8224.

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VILLENEUVE D'AGEN, or Villeneuve-Sur-Lot, a town of France, in the dep. of Lot-et-Garonne, in a charming valley, 15 miles north of the town of Agen. The river Lot divides it into two unequal parts, which communicate by a remarkably bold bridge of a single arch. The town, formerly called Gajac, was completely destroyed in the wars of the commencement of the 18th century. It was afterwards rebuilt, and then took its present name. A great trade is carried on in wines, prunes, cattle, and iron; there are manufactures of paper, cloth, table-linen, and copper-ware. Pop. (1876) 9681.

VILLENEUVE, Pierre-Charles-Jean-Baptiste-Sylvestre de, Vice-admiral of France, descended from an ancient and noble family, which has supplied an almost uninterrupted succession of distinguished ornaments to their country, was born at Valensoles, in the dep. of Basses-Alpes, December 31, 1763, entered the navy in his 15th year, and passed as captain in 1793. In 1796, he was raised to the rank of "captain of division" (equivalent to *commodore* in the British navy), commanded the rear-division at the battle of the Nile, and after that disastrous fight, succeeded in carrying off to Malta his own vessel, the *Gulllaums Tell*, and four others. In 1804, he was nominated vice-admiral; and in the following year, was appointed to the command of the Toulon squadron, with which he succeeded in reaching Cadiz, where he was joined by the Spanish fleet under Gravina. His orders being to attempt the withdrawal of the British fleet from the coasts of Europe, he bore away westwards across the Atlantic, reaching the Antilles on 14th May, and there making a number of valuable captures. A month afterwards, hearing that the British fleet had reached Barbadoes, he at once re-embarked his troops, and returned to Europe, pursued by Nelson. On reaching the Azores, however, he encountered a British squadron, under Sir Robert Calder, and a fierce combat ensued, which lasted till dark. On the following morning, neither side cared to renew the engagement (for which V. was abused by *Le Moniteur*, and Admiral Calder was put on trial), and V., unable to reach Brest, again returned to Cadiz, where he was strictly blockaded by Nelson. The unjust severity with which he was treated by Napoleon arose from the fact, that the battle off the Azores, and the subsequent blockade of the French and Spanish fleet in Cadiz, had completely ruined Napoleon's scheme for the invasion of England; and the further indignity of being superseded, hurried the unfortunate V. into the desperate resolve of engaging Nelson before his successor could arrive at Cadiz. Besides, by a stratagem of Nelson, he was led to believe that the strength of his enemy was such as to afford him a favorable opportunity of wiping out the disgrace of his former failures, and he accordingly, in superior force, sallied out of the harbor, and engaged in the memorable conflict of Trafalgar (see **TRAFALGAR**, and **NELSON**). A passage in the instructions issued to his captains on October 20, sufficiently shews the irritated state of his feelings—"Every captain who is not under fire is not at his post, and a signal of recall will be a brand of dishonor to him." V., whose vessel, the *Bucentaure*, was completely dismasted, was forced to strike his flag, and was made prisoner, and conveyed to England, whence he returned to France in April 1806. Instead of rendering himself at Paris, he stopped at Remer, with the view of ascertaining the kind of reception he was likely to meet with from the emperor. The result of his inquiries was unfavorable; and on the morning of April 23, he was found dead in bed, with six knife-wounds in his heart. He had died by his own hand.

VILNO (often written **VILNA**), a government of West Russia, bounded on the w. by Poland, from which it is separated by the Niemen; and on the e. by the government of Vitebsk, from which it is separated by the Western Dwina, and by that of Minsk. Area, 16,320 sq. m.; pop. (1870) 1,001,909, mostly Lithuanians, Slavonians, Jews, and Tartars. Only 18 per cent. of the whole pop. are Poles. The rivers are the Villa, Beresina, affluents of the Niemen, and the Dvina, which flows north into the Dwina. The surface is flat; the highest part being only 1100 feet above sea-level. The soil, in some places very fertile, consists for the most part of clay and sand. Marshes abound, and there are 400 small lakes. The woods which cover the marshes are the great source of the wealth of the government. The principal trees are fir and pine, and the timber is floated down the Niemen and Dwina for export, and used in the interior for shipbuilding, &c. The climate is mild. There are a good many manufactures in the government; but agriculture is the principal occupation of the inhabitants, and fairs are numerous and important.

VILNO, an important city of West Russia, capital of the province of the same name, picturesquely situated on the Villa, 478 miles south-west of St Petersburg. Besides its cathedral, it is remarkable for the number of its religious edifices, among which are a mosque, several synagogues, and Lutheran meeting-houses. It formerly contained a university, founded in 1576, but abolished in 1832. Among existing institutions, the chief are the observatory, medical society, museum of antiquities, and theatre. The principal articles of trade are timber and corn. Manufactures are not important. Pop. (1867) 79,265.

In 1323, Gedimin, Grand Duke of Lithuania, transferred his capital from Troki to Vilno. In 1795, after the final annexation of Lithuania to Russia, V. was made the chief town of the government of the same name.

VINAGO, a genus of *Columbidae*, the most marked section of that family, having a comparatively stout solid bill, laterally compressed; with a hard, hooked, and inflated tip; the tarsal short, the feet large, and formed for perching or grasping. The species, of which not many are known, are natives of the tropical parts of Asia and Africa. They inhabit forests, and are shy and timid birds.

VINARO'Z, a town of Spain, in the province of Castellon de la Plana, on the coast of the Mediterranean, 88 miles north-north-east of Valencia. Ship-building is carried on, and there are active fisheries. The bay is open and unsafe. Pop. 9193.

VINCA. See **PERIWINKLE**.

VINCENNES, a commune and market-town of France, in the dep. of Seine, five miles east-south-east of the Louvre in Paris. In reality, the town is merely a great fortress and barracks, and is famous for its arsenal, and for its school for the practice of shooting. At the latter, the Chasseurs de Vincennes, and all the best marksmen of the army, are trained. Pop. (1872) 11,081; (1876) 13,243.

V. owes its historical importance to its castle and park. The château, the main object of interest in the town, is rectangular in shape, and dates from the middle of the 14th century. It was surrounded by nine towers, which were in existence down to the year 1806, but of which only one, known as the Donjon de Vincennes, 170 feet high, and with walls 17 feet thick, remains. The original building dates from the reign of Louis VII., and had its origin in a hunting-lodge, erected here by that sovereign in 1137. Philippe-Auguste enlarged it, and stocked its woods with wild animals, sent to him by the king of England. Here Queen Jeanne (wife of Philippe le Bel), Louis le Hutin, and Charles le Bel, ended their days. Philippe de Valois caused the old mansion to be demolished, and laid the foundations of the more modern château, which, from the middle of the 14th c. till the time of Louis XV., was a royal residence, and the birthplace and place of death of many princely personages. After this time, it was used as a prison, and among the famous men who have languished within its donjon, may be mentioned Henry IV., the Prince of Condé, Cardinal de Retz, Mirabeau—who here wrote his translation of Tibullus—and the Duc d'Enghien, who was shot in the moat of the castle by order of Bonaparte. There are extensive barracks, known as the New Fort, built 1843—1853, and a Salle d'Armes, with a large collection of all sorts of weapons. In the centre of the Bois de Vincennes, a large tract has been cleared as an exercise-ground for troops, and for rifle and artillery practice. Other parts of the Bois, which presents much fine scenery, have been embellished with artificial sheets of water, rivelets, and agreeable walks.

VINCENNES, a city of Indiana, U. S., America, on the left bank of the river Wabash, on the Ohio and Mississippi, and Evansville and Crawfordsville Railways, 110 miles south-west of Indianapolis. It is the entrepôt of a rich agricultural country, has a well-endowed university, Roman Catholic bishopric, seminary, and academy, two semi-weekly and three weekly newspapers, and considerable manufactures. A French trading-post was established here in 1710, and a colony in 1735, which lived peacefully with the Indians. Until 1813, it was the capital of the North-west Territory. Pop. (1870) 5440; (1880) 7680.

VINCENT, St, a British island of the West Indies, belongs to the Windward Group, and lies about 28 miles south of St Lucia, and 100 miles west of Barbadoes. Lat. 13° 10' n., long. 61° 5' w. It is 18½ miles long, 11 miles broad, has an area of

131 sq. m., and contained (December 1871) 35,688 inhabitants, of whom a few were white, about a fifth part were colored, and all the rest black. A chain of mountains traverses the island from north to south, and throws out lateral branches, between which are ravines, which widen into valleys as they approach the sea-shore. Evidences of volcanic action are everywhere visible on the island—strata are upheaved and disturbed, and huge masses of rock have been displaced. In the interior is a volcanic mountain, 3000 feet high, the crater of which is half a mile in diameter. The climate is hot, the temperature ranging from 75° to 87°. The annual rainfall is about 76 inches. No valuable minerals have as yet been discovered. The chief products are sugar, arrowroot, rum, cotton, and molasses; the value of the exports in 1873 was £202,902—that of the imports, chiefly linen, cotton, and woollen manufactures, manures, flour and wheat, fish dried or salted, pork salted or cured, hardware and cutlery, leather and leather manufactures, timber, butter, and mules, was £161,498. Nearly 700 vessels enter and clear the ports annually. Religion and morality are at a low ebb—more than half the children are reported as illegitimate. There are above 30 schools, attended by over 2000 children. The revenue, derived chiefly from export duties, was (in 1873) £29,217; the expenditure, £23,683, of which a considerable sum was employed in the repair, &c., of roads. The government consists of a lieutenant-governor, a legislative council, and 12 elective members of Assembly. The capital is Kingston (q. v.), and the other one or two small towns or villages are of little note. In 1861, the importation of coolies from India was commenced, 500 of them having been brought to the island in that year. Shocks of earthquake are frequent; hurricanes occur at intervals, and the violent rains occasionally damage the crops and roads.

VINCENTIAN CONGREGATION, so called from its founder, the Roman Catholic saint, Vincent de Paul, is an association of secular priests, who, although not in the strict sense a religious order, are bound by vows, and are especially devoted to the duty of preaching and hearing confessions among the people, particularly the poor. Another object of the V. C. is to undertake the direction of episcopal seminaries and other colleges for the education of ecclesiastics, as also to direct the annual devotional exercises of the secular clergy, called Ecclesiastical Retreat. See PAUL, VINCENT DE. At the latest recorded enumeration which has come under our notice, the Congregation numbered above 700 members, in France, Italy, Poland, the Levant, and Algeria. The members are numerous also in America, and branches exist in Ireland and Scotland. The name Vincentian is sometimes given also to the Sisterhoods (of which there are several, and of which that of Charity is the most remarkable), which were founded by Vincent de Paul, and even to the Charitable Lay Association, better known as the Society of St Vincent de Paul, which has extensive ramifications in almost all the countries in communion with the church of Rome, and which has been the occasion of certain recent restrictive measures in France. See BROTHERS AND SISTERS OF CHARITY; PAUL, VINCENT DE.

VINDHYA MOUNTAINS. See INDIA.

VINE, a term sometimes used to designate any climbing plant, especially if shrubby, but also more particularly applied to the species of the genus *Vitis*, of the natural order *Vitaceæ*. This genus has *pentamerous* flowers (5-toothed calyx, 5 petals, 5 stamens), and has the petals united into a kind of hood and deciduous. The most important species is the GRAPE VINE (*V. vinifera*), from the fruit of which wine and raisins are made. The name grape is from the French *grappe*, a bunch of grapes; from the same root as *gripe* or *grab*, to grasp.

The grape vine has large, angular, lobed, toothed, and more or less hairy leaves. The stems are numerous and branching, very long, and of rapid growth, with many tumid joints, the outer bark readily splitting and peeling off, the woody tissue abounding with vessels of large size, from which, at the seasons of active vegetation, if the branch is wounded or cut across, the sap pours in prodigious quantity. The fruit-stalks, which are much branched, are opposite to the upper leaves, or in their stead are tendrils. The flowers are small, greenish white, and fragrant. The fruit is a round or oval berry, 2-celled and 4-seeded, varying much in size and color—in the small Corinth or Currant Grape, about $\frac{1}{4}$ th of an inch in diameter; in the largest varieties, more than half an inch; green, yellow, red, purple, and sometimes variegated; but the color is entirely in the outer skin, the juice being always color-

less; and whilst the pulp of the grape is wholesome, nutritious, and gently laxative, the skin is astringent and indigestible. Some of the ovaries are often abortive, or even all of them in the fruit of old vines of some varieties, as in the seedless Ascalon or Sultanah raisins.

The vine attains a large size, the stem being sometimes 18 inches in diameter, so that the wood, which is very hard and durable, has been employed for making furniture, statues, &c. It attains also a very great age, continuing fruitful for at least three or four hundred years.

The grape is one of the most valuable of fruits, not only because of its use in the manufacture of wine, and as the source also from which brandy, vinegar, and tartaric acid are obtained, but because, both in a fresh and dried state, it forms not a mere article of luxury, but a great part of the food of the inhabitants of some countries. Dried grapes, under the names of *raisins* and *currants*, are a considerable article of commerce. Fresh grapes are commonly eaten with bread in Syria, and some other countries in which they abound. The usefulness of the grape is increased by its keeping fresh for many weeks in a cool airy place. Some varieties are more easily kept than others. More than 1500 varieties are described in works on the culture of the grape; and this subject, under the name *Ampelography* (Gr. *ampelos*, a vine), has been elevated by some recent German writers almost to the rank of a distinct branch of science. The quality of the grape is extremely liable to be affected by circumstances of soil and climate, and this is particularly to be observed in the wine produced from it, the difference between the produce of two vineyards in the same neighborhood being often very remarkable.

The vine dislikes a damp soil, but will thrive in almost any open soil with good drainage. In rich deep soils, it grows luxuriantly, and produces abundance of large fruit; but on shallow, dry soils, the fruit, though less abundant, is of finer flavor. The vineyards most celebrated for the excellence of their wines are not generally of rich soil. The steep slopes of hills are often planted with the vine, and are sometimes terraced for this purpose; and nothing can be more suitable to situations where patches of good soil are mingled with bare rocks, nor anything more beautiful than the rocks covered with luxuriant foliage and rich fruit. This mode of cultivation on steep rocky slopes was anciently very prevalent in Judæa.

It is doubted of what country the grape-vine is a native, nor is it known at what time, certainly very remote, its cultivation was first introduced into the south of Europe. It is now found wild in some parts of Europe, but is rather naturalised than truly native. It seems probably that it is indigenous in the hilly countries on the south of the Caspian Sea, where it is very abundant and luxuriant, climbing to the tops of the loftiest trees, and producing large bunches of delicious fruit. But it is doubted if *Vitis Indica*, a native of the north of India, abounding in some parts of the Himalaya, is really a different species. The wild grapes of these mountains are round and purple, and very agreeable. It is doubted also by some if any of the wild grapes of America are really distinct; some of which, however, are much more different in their characters and qualities from the common form of the cultivated plant. Of these American grapes, the Fox GRAPE (*V. Labrusca*) is the most similar to the cultivated grape. It is common throughout great part of North America, and is found as far north as Quebec. The berries are large, deep blue, with thick skin and tough pulp, but make good wine, and have been found capable of much improvement by cultivation; their color also varying to red and white. The CHICKEN GRAPE (*V. cæstalis*), not found north of lat. 42°, has smaller and more agreeable berries, which are regularly brought to the Philadelphia market. Very similar to this is *V. cinnata*, a native of Virginia and Carolina, from the fruit of which good wine is made.—The BULLACE GRAPE (*V. rotundifolia*), found only as far north as lat. 39°, has larger grapes than any other American species, and of agreeable flavor.—There is also a species (*V. cordifolia* or *vulpina*) with small nauseous berries, and one (*V. riparia*) found abundantly on gravelly banks of rivers in the western states, which has exquisitely fragrant flowers. But the habit and leaves of all these differ very little from those of the common vine. Nor does the WATER WITHE of Jamaica, so called from the great quantity of sap which its shoots pour out when cut (*V. Caribæa*), differ in very marked botanical characters; although its small black berries, which it produces in immense quantity, are acid and austere.

The cultivation of the grape and the making of wine are of the most remote

antiquity, as appears from the Scripture history of Noah, and from many passages of the most ancient authors. The mythological fable of the marriages of Bacchus relates to the extension of the culture of the vine from Asia into Europe. The earliest accounts we have of the manner of cultivating the vine are by the Roman authors Virgil and Columella. The vine was probably introduced into the south of France as early as into Italy; it is said to have been brought to Marseille by the Phœceans, about 600 B.C., and its cultivation was early co-extensive with civilisation in all the countries near the Mediterranean. In Italy, so much of the land was occupied by vineyards, that the Emperor Domitian, fearing a scarcity of corn, issued a restrictive or prohibitory edict, 81 A.D., which was afterwards long continued in force, through fear that the abundance of fine wine might tempt the barbarians of the north to invade the country. The vine was introduced into the south of Germany about the 3d c. B.C. Augustus preferred the Rhetian wine to all other. The first vineyards on the Rhine and Moselle were planted by the Emperor Probus in 281 A.D. Under the Merovingians, the culture of the vine extended greatly both in France and Germany. Charlemaigne derived a very considerable revenue from the vineyards even of the northern parts of his empire. The Huns who remained in a number of settlements on the Rhine, after the expedition of Attila into Gaul, 451 A.D., brought thither the arts of cultivating the grape, and of making wine, from Pannonia; and Hunnish grapes and Hunnish wine were long in particular repute. In the middle ages, the monks were the first to plant vineyards and to make wine in many parts of Europe.

The cultivation of the vine was introduced into England by the Romans. At the time of the Norman Conquest, there seem to have been vineyards in the south and south-west of England, and although they afterwards disappeared, successful attempts were occasionally made to re-establish them; and one at Arundel Castle in Sussex yielded, about the middle of last century, large quantities of wine. Of late years, the cultivation of the vine has much increased in the south of England, in gardens, on the walls of suburban villas and of cottages, but chiefly for the sake of the fresh fruit, although wine of pretty good quality is also made in small quantities for domestic use.

The vine does not, in ordinary seasons, ripen its fruit well in Great Britain further north than Yorkshire, although grapes have occasionally ripened in the open air in Scotland. It is, however, a hardy plant, in so far as the endurance of severe winter-frosts is concerned; but it requires for the ripening of its wood, as well as of its fruit, a considerable summer-heat continued for several months. Thus, it does not succeed in parts of Britain in which the mean temperature of the year is higher than that of countries where good wine is made. A very moist climate is also unsuitable to it; and therefore it is not extensively cultivated in the north-west of France, although there are many productive vineyards in the north-east. In the most northern regions to which its cultivation extends, the vine is protected in various ways during winter; in some places, by laying down its branches, and covering them with some depth of earth. It produces abundant fruit in warm climates, such as India, but the juice passes too rapidly into acetous fermentation to be used for making wine, although in many of the mountainous districts of India it might probably be cultivated for this purpose with success. Shiraz, in Persia, is one of the warmest climates celebrated for the production of good wine.

In Europe, the cultivation of the vine forms an important branch of rural economy as far north as Coblenz on the Rhine; but in some countries, particularly in Greece and the Ionian Islands, raisins form the chief part of the produce of the vineyards.

The cultivation of the vine was early introduced by the Spanish and Portuguese into the Azores, the Madeira and Canary Isles, and America. The first vines were carried to the Cape of Good Hope by the Dutch in 1650; but whilst the wines of Madeira and those of the limited district of Constantia at the Cape of Good Hope have long enjoyed a high celebrity, and those of Canary and Tenerife have been imported in considerable quantities into Europe, it is only of late that much attention has begun to be paid to the cultivation of the grape in the other parts of Cape Colony, or in any part of America. It is now, however, prosecuted with some energy in Ohio, Missouri, and some other states of North America, and very good wines are produced. It has also been introduced into Australia, where good wines are made, although not yet to a large extent.

The cultivation of the vine varies much in different countries. Success seems chiefly to depend on a good sunny exposure, liberal but not coarse manuring, and constant attention. New varieties are raised from seed, but the ordinary mode of propagation are by layers and cuttings. Five varieties are sometimes budded or grafted on less valuable ones. In the vineeries of Britain, the vines are carefully trained, in various ways, so as most completely to cover the walls and trellises, and to turn the whole available space to the utmost account; whilst superfluous shoots are displaced by pruning, so that the strength of the plant may be directed to the fruit-bearing branches, and that there may be no undue luxuriance of foliage to prevent sufficient access of light and air. The luxuriant growth of the plant renders the frequent application of the pruning-knife necessary during summer. The fruit being produced on shoots of the current year, the pruning is managed with a view to the abundance of these shoots, the greater part of which, when they have served their purpose, are cut away, such only being left as are required for the extension of the space profitably occupied by the plant. The bunches of grapes are also generally thinned out with great care, in order that finer fruit may be produced. By such means, and the aid of artificial heat, grapes are produced equal to those of the most favored climates, and the vine attains to a large size and a great age. The famous vine at Hampton Court has a stem more than a foot in circumference, one branch measuring 114 feet in length, and has produced in one season 2200 bunches of grapes, weighing on an average one pound each, or in all nearly a ton.

In the warmer countries in which the vine is cultivated, as in Italy, it is generally allowed to grow very freely, attaching itself to trees or espaliers; but in more northern regions, it is commonly much pruned down, so that, instead of luxuriance and beauty, the vineyards exhibit a stiff and formal regularity. In some places, the vines are attached to poles; in others, they are pruned so close and kept so low as merely to form bushes which require no support. This mode of cultivation is sometimes adopted also in comparatively warm climates, as in some of the vineyards of the south of France, and in those of Constantia, at the Cape of Good Hope.

Only a few varieties of grape cultivated in Britain are at all suitable for the open air. By a judicious selection of varieties, as well as by variously regulating the application of heat, the grape season in vineeries is greatly prolonged.

Grapes are sent to market in Britain in large quantities from the numerous vine-ries; they are also imported from Portugal, Spain, France, and Holland, generally packed in sawdust, but the close packing and the sawdust are injurious to their flavor.

Great ravages have been made of late years on vines in many countries by the *vine disease*, or *vine mildew* (*Oidium Tuckerii*; see *Oidium*); and, in France, by the *Phylloxera vastatrix* (q. v.).

The juice of ripe grapes contains a considerable quantity of *grape-sugar* (see *SUGAR*), small quantities of a glutinous substance, and of extractive, bitartrate of potash, tartrate of lime, a little malic acid, and other ingredients, suspended or dissolved in water. The rapidity with which it passes into a state of fermentation after being expressed from the fruit, is remarkable.

For the making of wine, the wine-trade, the qualities and uses of wine, the different kinds of wine, &c., see *WINE*. Concerning the other commercial products of the grape, see *BRANDY*, *VINEGAR*, *TARTARIC ACID*, *RAISINS*, and *CURRENTS*.

VINEGAR is that form of *ACETIC ACID* (q. v.) which is generally preferred for culinary purposes, and which is made by the fermentation of vegetable substances. In Great Britain, it is manufactured on a large scale by the fermentation of malt; on the continent of Europe, it is as largely made from low wines which have turned sour. Malt, or British vinegar, as it is sometimes called, is made by brewing a weak wort from malt exactly as for Beer (q. v.). To 100 gallons of this, at a temperature of 70°, are added 4 gallons of yeast, and well stirred through for 8 or 10 minutes. This mixture is then allowed to ferment actively for two days, and is then transferred to the stoving-room; here it is distributed into a number of tubs, which, when filled, are covered over with coarse canvas. This room is dark, and is heated by stoves, and the heat is constantly sustained for weeks until the conversion of the wort into vinegar is complete. The process of acetication is accelerated by introducing into the casks with the wort either the residuary fruit used in making domestic wine, or the foot-stalks and skins of grapes. This *rape*, as it is called,

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acts as a kind of ferment. Other processes are used by different manufacturers for the purpose of producing it quicker; but the minute descriptions necessary to render them clear would be out of place here. Much vinegar is also made of beer which has become sour; it is, however, very inferior in quality, and wants the agreeable flavor of malt vinegar prepared by the above process, which is due to the presence of acetic and other ethers.

A rather insipid kind of vinegar is made by means of the Vinegar-plant (q. v.). The vinegar-plant itself may be produced thus: A solution of a quarter of a pound of sugar and half a pound of treacle in three quarts of water is first simmered, then poured into a jar, covered up, and kept in a warm place for six weeks. The liquid becomes vinegar, and on the top there has been formed a scum-like fungus, which is the vinegar-plant; and by adding a piece of this to a similar solution, the process of conversion into vinegar now takes place in much less time. During the process, the plant thickens by the formation of a new layer on its under surface; and by peeling off this layer, and using it in a fresh operation, the plant may be propagated indefinitely.

The greatest manufacture of *wine vinegar* in Europe is at Orleans, in France. Here the wines are sent from all parts when unfit for drinking, and are converted into vinegar. In the manufacture, a large number of casks are used, with openings into each of only two inches diameter. Into each one are poured 100 pints of vinegar boiling hot; and to this, after eight days, are added 10 pints of sour wine, and this is repeated every 8 days until the cask is full; another 15 days completes the process, and the vinegar is ready for use. Beech-shavings are much used in vinegar-making, as they are found to assist in clarifying the liquor by attracting the lees, which settle upon them, and leave the liquor clear, in which state it acidifies more rapidly.

"According to Ure, a good vinegar may be prepared by adding to each gallon of a syrup composed of 1½ lb. of sugar and 1 gallon of water, a quarter of a pint of yeast. If kept for three days at a temperature of 75° or 80°, it will be sufficiently acidified to allow of being drawn off into the refining cask, where one ounce of bruised raisins and one ounce of crude tartar are to be added to each gallon of liquor. When the sweet taste has quite disappeared, it should be drawn off into bottles, and corked down tightly. It is stated that such vinegar will contain 5 per cent. of pure acetic acid"—Miller's "Organic Chemistry," 2d ed. p. 339. Vinegar prepared by these methods contains a large amount of foreign matters, which can be got rid of by simple distillation; the acid liquid which comes over constituting what is known in pharmacy as *distilled vinegar*. What is sold commercially as distilled vinegar is simply acetic acid distilled from wood (see *PYROLIGNEOUS ACID*), and diluted with five times its volume of water. This constitutes also the vinegar used by pickle manufacturers; it is quite as wholesome as common vinegar, but wants its agreeable flavor; its preservative powers are, however, much greater, and its price very much less, if fairly charged. Vinegar containing 5 per cent. of the pure acid is the strongest that is ever produced, and is termed *proof vinegar*. There are four kinds manufactured, which are known in trade by the numbers 18, 20, 22, and 24, the last being the best quality. The strength of any specimen is best ascertained by determining the quantity of anhydrous carbonate of soda which a given weight of it will neutralise, it being recollected that 100 grains of carbonate of soda correspond to 96·2 grains of anhydrous acid. The ammonia test, according to Neilson, serves to distinguish French from English vinegar: with the former, the color is purplish; with the latter, there is either no change, or it is brownish. There is generally a slight turbidity, which is due to a trace of lime.

As a condiment, vinegar is an ingredient of a large number of sauces, and of all ketchups and pickles; and although it cannot be regarded as an essential article of food, its applications in cookery are numberless. Young ladies, with an undue tendency to corpulency, sometimes drink vinegar freely with the view of improving the figure; but as vinegar only causes thinness by injuring the digestion, it is obviously not worth while that they should run the risk of exchanging slight fulness of habit for chronic dyspepsia.

Vinegar is used in medicine as a cooling astringent, and may be employed with much benefit if taken freely, when largely diluted with water, in hæmoptysis, in hæmatemesis, and in the colliquative sweating of hectic fever. Dr Neilson states that in severe hæmorrhage, he has often seen benefit derived from a dose of a wine-

glassful of vinegar. In cases of poisoning with the alkalies or their carbonates, it is one of the best antidotes. It may also be employed locally in various ways—as, for example, to check hæmorrhage from the nose, womb, &c. In intestinal hæmorrhage, an enema containing vinegar and cold water may be used with success, especially if the lower part of the intestine be the seat of the bleeding. Sponged in a diluted state (one part to three of cold or tepid water) over the neck, chest, &c., it affords great comfort and considerable relief in cases of colliquative sweating. In its character of a refrigerant rather than as an astringent, its local action on the skin is attended with much benefit in the treatment of most febrile and inflammatory diseases; it should be freely applied, as in colliquative sweats, to the surface of the body, face, and extremities; and thus employed, has a very tranquillising effect, and often induces sleep. The heat and pain commonly experienced in sprains are often relieved by the local application of brown paper soaked in diluted vinegar, and changed when the feeling of heat returns. It is an important addition to astringent gargles in cases of relaxed uvula and tonsils; and is the best application to the eyes in cases in which lime has got within the eyelids. The ordinary dose is from 2 to 4 drachms; and when taken as a drink, 3 ounces may be mixed with a pint and a half of water, and taken in the course of the day.

The term *Chili vinegar* is applied to a preparation obtained by infusing half an ounce of cayenne pepper in a quart of French vinegar for ten days, and straining. It is commonly added to gargles in the proportion of 1 ounce to 8 or 9 ounces of infusion of roses, in cases of relaxed sore throat.

Aromatic Vinegar, known also as *Vinegar of the Four Thieves*, *Marseille Vinegar*, and *Camphorated Acetic Acid*, consists of strong acetic acid, holding in solution camphor and the oils of cloves, lavender, rosemary, and lemon. It is very fragrant and volatile, and must be kept in well-stoppered bottles. It was formerly regarded as a valuable prophylactic of all infectious diseases, but is now only used as an external stimulant, the vapor being applied by a smelling-bottle to the nostrils in cases of fainting.

VINEGAR-PLANT (*Penicillium glaucum*), a fungus of the sub-order *Hyphomycetes*, but somewhat resembling those known by the name of *Mould* (q. v.). It forms a flocculent mass or web, which is tough and crust-like or leathery, and when examined by the microscope, is seen to consist of a *mycelium* of branched threads, with the branches somewhat tangled, and the spores disposed in patches about the pencil-shaped ends of fertile threads. It is found on decaying bodies and in fluids undergoing the acetous fermentation, which it greatly promotes, and which, indeed, it very readily occasions, a small piece placed in sugar and water soon changing it into vinegar. Advantage is sometimes taken of this property for making vinegar.

VINET, Alexandre-Rodolphe, Swiss divine and author, was born at Lausanne, June 17, 1797, and received his education in his native city as a student of the Protestant Church, of which he was ordained a minister in 1819. From an early age, he shewed a passionate fondness for the study of French literature, which he cultivated with so much success, that at the age of 20 he was appointed Professor of French language and literature in the gymnasium of Basel. This position he held till 1837, when he removed to Lausanne, to fill the chair of Practical Theology in the Academy of that city, which chair, however, he resigned in 1840, when he seceded from the national church, on account of the new constitution imposed upon it in that year. Notwithstanding his resignation, he appears to have continued his lectures either in the Academy or privately; and in 1844 again connected himself with that institution as Substitute-professor of French literature. V. took a leading part in the formation of a constitution for the Free Church of Vaud, formed by those who seceded from the national church in 1845, this secession having been in a great measure the result of the influence of his own writings and teachings in favor of the separation of church and state. He died 18th May 1847. V. was an eloquent and earnest preacher, clear and brilliant, rather than profound in thought; and although highly evangelical and orthodox, advocated the utmost liberty and toleration of opinion and practice in matters of religion. He wrote largely both on literature and religion, and most of his works have been translated into English. His works on French literature shew that he was thoroughly acquainted with its history, and pos-

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essed the critical faculty in no mean degree; as a philosophico-religious writer, he is very popular among the educated religious public both in England and America. His principal works are: "Chrestomathie Française" (8 vols. 1839); "Histoire de la Littérature Française au XVIII. Siècle;" "Études sur la Littérature Française du XIX. Siècle," 8 vols.; "Mémoire en Faveur de la Liberté des Cultes" (1836); "Discours sur quelques Sujets Religieux" (1831), and "Nouveaux Discours," &c., (1841)—from which two last-mentioned works selections have been translated into English, and published under the title of "Vital Christianity;" "Études sur Blaise Pascal," "Études Évangéliques," and "Nouvelles Études Évangéliques," which have been rendered into English as "Gospel Studies," &c.

VINIC ACIDS, an important group of acids, whose mode of formation may be thus described. When a mixture of concentrated sulphuric acid with any of the alcohols is heated to about 219°, chemical action takes place, and the result is the formation of a new coupled or conjugated acid, in which the elements of one molecule of the alcohol and one of sulphuric acid (taken, according to recent views, as S_2O_6) are present. In these compounds, the existence of sulphuric acid can no longer be detected by the addition of baryta; the new acids forming soluble baryta-salts. As examples of these acids may be mentioned sulpho-methylic acid, HO, C_2H_4O, S_2O_6 , and sulpho-ethyllic acid, HO, C_2H_4O, S_2O_6 , which has been already described under its old name of *Sulphovinic Acid*.

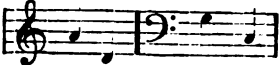
VINLAND—I. e. Wineland—the name given to the chief settlement of the early Norwegians in North America. It is undoubtedly represented in modern times by part of Massachusetts and Rhode Island. The first that saw it was Bjarne Herjulfson, who was driven thither by a storm in the summer of 986 A.D., when making a voyage from Iceland to Greenland, of which country, his father, Herjulf and Eric the Red, were the earliest colonists. But Bjarne did not touch the land, which was first visited by Leif the Lucky, a son of Eric the Red, about 1000 A.D. The latter built a number of wooden houses, which were called *Leifsbúðir* (Leif's booths?). A German of the name of Tyrker, who accompanied him, noticed the grape growing there, as in his native country, and hence Leif called the region "Vinland." Two years after, Leif's brother, Thorwald, arrived, and in the summer of 1003, led an expedition along the coast of New England, southwards, but was killed the year following in an encounter with the natives. The most famous of the Norwegian explorers, however, was Thorfinn Karlsefne, an Icelander, who had married Gudrid, widow of Thorstein, a son of Eric the Red, and who in 1007 sailed from Greenland to V. with a crew of 160 men, where he remained for three years, and then returned, after which no further attempts at colonisation were made. Rafn (q. v.), in his "Antiquitates Americane," has published the most complete collection of the evidence which proves the pre-Columbian colonisation of America. See Wilhelm's "Island, Hvítamannaland, Gröndland und Vinland" (Heidelberg, 1843). Both Rafn and Finn Magnúsen are excessively anxious to shew that Columbus derived his first hints of a new world from the accounts of these old Icelandic expeditions. Their *amor patriæ* perhaps leads them too far, but, on the other hand, it is well to bear in mind that Finn Magnúsen, in one of the early numbers of the "Nordisk Tidsskrift for Oldkyndighed," has conclusively established the fact that Columbus did visit Iceland in 1477, 15 years before he undertook his great expedition across the Atlantic; and it is not at all improbable that he may have heard, while there, something of the long-abandoned Vinland, and so had his adventurous thoughts first turned in that direction.

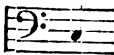

VINNI'TZA, a town of West Russia, in the province of Podolia, stands on both banks of the Bug, 100 miles east-north-east of Kamenez. It was founded in the 14th c., and has suffered much from the invasions of Tartars and Cossacks. There are very few factories, and the trade, which is not extensive, is carried on exclusively by the Jews. Pop. (1867) 10,694.

VIOL (Mid. Lat. *vitula*; Ital. *viola*, derivation uncertain), a musical instrument played with a bow, no longer in use, which was the immediate precursor of the violin. It is to be seen represented on monuments as far back as the close of the 11th century. The belly and back were flat; there were larger bends in the sides than in the violin; and frets, like those of the guitar, were placed on the neck of the instrument, to shew where the fingers of the left hand should be put to produce the

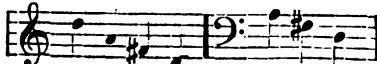
desired notes. There was great variety in the number of strings: in Germany, three, four, and five were all common; in Italy, there were usually six. The strings were tuned by fourths and thirds. There were four sizes of viol in use for treble, alto, tenor, and bass respectively, and they were often played together in concerted music. The smaller viols were called *viola da braccio*, from being held with the arm; the larger, *viol da gamba*, from being placed between the legs. The treble viol was rather larger than the modern violin. The viol da gamba, or bass viol, held its place longer than the smaller viols, but was eventually superseded by the violoncello.

VIO'LA. Alto Viola, or Tenor Violin, a larger description of violin, to which the part between the second violin and bass is generally assigned. It has four gut strings, the two lower covered with silvered copper wire. They are tuned by

fifths, thus, , exactly an octave above the violon-

cello. The compass is from  to , or higher, and the music is generally written on the alto clef.

VIO'LA D'AMORE, an obsolete instrument of the viol tribe, revived a few years ago with some success by M. Urhan at Paris. It had five or seven strings of catgut, which were placed and played as in other bow-instruments; but below them, and passing underneath the bridge, were five or seven other strings of metal tuned in unison with them, which vibrated sympathetically when the former were played; giving to the music a mysterious resonant character. The compass was at least three octaves and a half. The strings of M. Urhan's viola d'amore were tuned in thirds and fourths, thus:



VIOLA'CEÆ, a natural order of exogenous plants, of which about 300 species are known, natives both of temperate and tropical countries, those belonging to the former being generally herbaceous, and those belonging to the latter generally shrubby. They have simple leaves with persistent stipules. The calyx consists of five persistent sepals, usually elongated at the base; the corolla of five hypogynous petals, unequal in the sub-order *Viola*, and equal in the sub-order *Alsodea*. There are five stamens inserted in a hypogynous disc; the filaments prolonged beyond the anthers. The ovary is one-celled, generally with many ovules, the style single, with an oblique stigma. The fruit is a three-valved capsule, with many seeds. The best known species are the *Violets* (q. v.), noted for their beauty and fragrance. Emetic and purgative properties prevail in the order, and some of the South American species, particularly of the genus *Ionidium*, yield valuable medicines. See *IPÊCACUANA* and *COICHUNCHULL*. Yet the leaves of the Lobolobo (*Conohoria* or *Alsodeia* *lobolobo*) are used in Brazil as spinach.

VIOLNET PROFITS, in the Law of Scotland, mean the income or rent enjoyed by one who forcibly or unwarrantably detains land to which he has no title. Such profits are held to be the full profits which the landlord could have made either by possessing the lands himself or by letting them.

VI'OLET (*Viola*), a genus of herbaceous plants, mostly perennial, of the natural order *Violaceæ*. They have a short stem, or are stemless, having in the latter case a short root-stock (rhizome); the leaves are alternate, and have long stalks; the flowers have five petals, different in form and size, the lowest having a spur behind. Nearly 300 species have been described, natives chiefly of northern temperate countries. Several species are much cultivated in gardens, some, as *V. tricolor*, on

account of their beautiful flowers; others, as *Vodorata*, on account of their fragrance. *V. tricolor*, the PANSY V., or HEART'S EASE, is very abundant in fields, meadows, woods, &c., in Britain and in most parts of Europe, and the north of Asia; it is also found in North America, although it has probably been introduced there from the old world. It is a very variable plant, its flowers differing much in size and color, but is readily distinguished by its large lyrate-pinnatifid stipules. The stem is somewhat triangular, branching, and diffused. In some of its most common forms, this plant is a mere despicable weed, with small flowers; other wild forms have much larger flowers; and to it are referred the large and beautiful garden pansies, the varieties of which are innumerable. The Pansy (Fr. *penée*, probably from the drooping attitude of the flower, suggestive of thoughtfulness) is one of the finest of florists' flowers, and no flower has been more improved by cultivation. Another species has of late years been introduced into cultivation, *V. Atitica*, a native of Siberia, and by itself, or by hybridisation with *V. tricolor*, has become the parent of many garden pansies. In a wild state, it has oval leaves, and large yellow or purple flowers. The finest garden pansies are not preserved or propagated without great difficulty, and require most careful cultivation, without which they quickly relapse to their wild forms. Florists demand that a pansy shall have a round, flat, and very smooth edge, the petals thick and velvety, the three lower petals alike in their ground color, the lines or pencillings in the centre bright and distinct, the two upper petals—which always differ in color from the others—perfectly uniform, the flower measuring at least an inch and a half across.—The SWEET-SCENTED V. (*V. odorata*) is common in grassy places in England, and throughout Europe and the north of Asia. The flowers are either of a deep blue color, or more rarely white. Several other species, with pale blue flowers, and destitute of smell, are common in meadows and woody glades in Britain and other parts of Europe.—The DOG V. (*V. canina*) is one of the most common ornaments of hedgebanks.—North America has a number of species, one of which, *V. blanda*, is sweet-scented. The Himalayas produce a number of species very similar to those of Europe. The roots of several species of V. were formerly used in medicine. They contain a bitter alkaloid, *Violins*, which acts as an emetic and purgative. The petals of the sweet-scented V. are used for the preparation of *Juice* or *Syrup of Violets*, which is used as a gentle purgative for children, and also as a chemical test, being reddened by acids, and rendered green by alkalis. The bruised leaves of *V. tricolor* are sometimes used as a remedy for ringworm.—The DOG'S TOOTH V. (*Erythronium dens canis*) has no connection with this genus, but is a very beautiful flower of the natural order *Liliaceæ*.

VIOLET STONES, the name given to certain stones found upon high mountains, as in Thuringia, upon the Harz Mountains and the Riesengebirge, which, in consequence of being covered with what is called *Violet Moss*, emit a smell like that of violets. They retain this smell for a long time, and it is increased by moistening them.—The **VIOLET MOSS** (*Bryssus foliatus*), which some botanists have been inclined to rank with lichens, and others with fungi, consists of simple articulated threads, and spreads over the stones in the form of a delicate incrustation, which at first is a reddish brown, but in a more advanced stage, yellowish green. It was formerly in use as a popular remedy for feverish cutaneous eruptions.

V'OLIN (diminutive from *viol*), a stringed musical instrument played with a bow. Like other bow instruments now in use, it consists of a wooden sonorous chest, formed of two slightly arched surfaces, known as the back and belly, united by sides or ribs, with a curve or hollow on each side in the middle of the length—a neck or fingerboard attached to the chest, and strings, fastened at one end to the belly by a tailpiece or projection of wood, and at the other to the head or extremity of the neck, where they can be tightened or loosened at pleasure by turning-pins. The strings thus passed over the belly are raised up from it by a bridge; and on the belly there are two sound-holes opposite each other, of a form resembling the letter *f*, or rather the long *j*. The sounds are produced by drawing the bow across the strings, the upper surface of the bridge being convexly curved, so as to enable the bow to be drawn along each string separately, without coming in contact with the rest. The modern violin has four strings of gut, the lowest covered with fine silvered copper wire, or sometimes, in the best instruments, with silver or even gold

wire. These strings are tuned in fifths, thus,



, and the high-

est string is called the first. The bow is held in the right hand, and the different sounds of each string are obtained by stopping, i. e., pressing it with the finger against the fingerboard at certain distances, thus shortening the vibration portion, and raising the pitch of the sound. Very high notes are produced by the Harmonics (q. v.) of the string, which, instead of being pressed against the fingerboard, is touched lightly, the sound resulting from the vibration being, not as in ordinary cases, of the part of the string between the point of stopping and the bridge, but of a harmonic section of it. A peculiar modification of tone is produced by the application of the *mute*, or *sordino*, a little wooden instrument placed on the bridge. A violin or other bow-instrument may occasionally be played *pizzicato*, i. e., with the fingers, as a harp or guitar. The compass of the violin is about three octaves and a

half, from



to



, with all the intermediate semitones;

but the highest notes are apt to be harsh and squeaking. Though chiefly an instrument of melody, it is to a limited extent capable of harmony by double stops—chords of two notes may be struck together, and three or four notes may be played in arpeggio. Few instruments can compare with the violin in power of expression and execution. It has an unlimited command over a very wide range of sounds, to which any degree of piano and forte, of staccato and legato, can be imparted. In orchestral music, there are always two different violin parts for treble and alto, known as first and second violin; and the same is generally the case when the violin is used in concerted music, the usual arrangement of stringed quartet music being for two violins, viola, and violoncello.

Recent writers trace the origin of the violin to the Indian *Ravanastron*, yet played by the poor Buddhist monks who go begging from door to door, and traditionally believed to have been the invention of Ravanna, king of Ceylon, 5000 B.C. From the *Ravanastron* sprang the *Goudok* of Knasia, and the *Crieth* of Wales—the latter in use before the 6th c.—both of which seem to have differed from later instruments of the same tribe in having the upper surface of the bridge flat, so that all the strings had inevitably to be sounded at once. The Viol (q. v.) was the more immediate precursor of the violin and of its relatives of deeper pitch, the violone, Ho and double bass. The earliest violins seem to have been those of Gasparo di Salo in Lombardy, 1560—1610. During the 17th c., the family of the Amati at Cremona, including Andrew, his sons Jerome and Antonio, and Nicolo, son to Jerome, produced violins the wonder of succeeding times, whose tone and quality more recent makers have in vain sought to equal. Antonio Stradivari, also of Cremona, pupil of Nicolo, if possible surpassed the Amati, and for a time the repute of Cremona was kept up by the families of the Guarneri and Ruggieri. Next to the Cremonese violins, in the estimation of connoisseurs, stand those of the Tyrolese makers, Jakob Stainer, and Matthias Klotz and his sons. Experience has shewn that the minutest details of form and proportion, and the material of which each separate part is made, are matters of vital importance to the quality of the violin. The great makers seem by a succession of delicate experiments and observations to have attained to acoustical qualities of high perfection, which their careful workmanship and extreme dexterity enabled them in all cases unfailingly to reproduce. See Otto's "Treatise on the Structure and Preservation of the Violin;" Sandys and Forster, "History of the Violin;" Fétis, "Notice of Antonio Stradivari, with Re-



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searches on the Origin and Transformation of Bow-Instruments;" Hart, "The Violin" (1875).

VIOLONCE'LLLO (diminutive from Ital. *violone*, large viol or double bass), a large instrument of the violin class, held by the performer between his knees. It has four gut strings, the lowest of them covered with silvered copper wire,

and is tuned thus, in fifths:  Its compass extends from

 to  Its signature is usually the bass clef, the tenor or

treble clef being used for the higher notes.

VIOTTI, Giovanni Battista, an eminent violin-player, born at Fontanetto in Piedmont, in 1753, and chiefly educated under Pugnani at Turin. After holding for a short time the appointment of first violinist in the royal chapel at Turin, he relinquished that office, in order to travel in Europe with Pugnani. In Berlin, St Petersburg, Paris, and London, his playing created a *furor*. He first visited London in 1792, and was engaged there at Salomon's concerts, and for a time as leader of the orchestra in the King's Theatre. A groundless charge raised against him of being a Revolutionary agent, drove him from England; but after living for a time in retirement at Hamburg, he returned to London, entered into speculations which ruined his fortunes, and died there in 1824. His compositions include violin concerts and quartets for violin, tenor, and violoncello, violin duets and solos, and a few pianoforte compositions. His playing was characterised by a vigor of style and purity, as well as by brilliancy and elegance, previously unknown; and he has been considered the father of the modern violin school.

VIPER (*Vipera*), a genus of serpents of the family *Viperidæ* (q. v.), having the head depressed, oblong-ovate, somewhat compressed before, and wider behind the eyes; the head covered with shields, the tail with two rows of plates beneath. Some naturalists divide the genus into two: *Vipera*, having one rather large shield in front of the head, the rest of the head covered with small shields, and the muzzle more or less recurved; and *Peltas*, having three shields on the head larger than the rest, the nose blunt. To the latter section belongs the Common V. or Adder (*V. communis*, or *Peltas berus*), which is found throughout Europe from the north of Russia to the Mediterranean, and occurs in most parts of England and Scotland. It is not found in Ireland. It seldom attains a length of much more than two feet. The head is depressed, and almost oval, slightly widening behind the eyes; the gape as long as the head. Although there are no teeth, except the poison-fangs, in the upper maxillary bones, there is a row of small teeth in the palatine bone on each side. The neck is rather smaller than the back of the head. From the neck, the thickness increases to near the middle of the entire length, and then diminishes to the vent. The tail tapers more rapidly, and ends in a point. The tail varies in the proportion of its length to that of the body, but is generally not more than one-third of the entire length. The smaller shields of the head are in some specimens very symmetrically placed, but irregularly in others. The ground color varies considerably, being in general nearly olive, rich deep brown, or dirty brownish yellow. A mark between and rather behind the eyes, a spot on each side of the hinder part of the head, a row of confluent rhomboidal spots running along the upper surface, the whole length of the body and tail, and a row of small irregular triangular spots on each side, are much darker than the ground color, often almost black; and in all varieties of color these markings appear. The under parts are of a lead color. Vipers are sometimes found of color very different from the ordinary kind, which some naturalists have too hastily described as distinct species. Thus, in some parts of England, a *Black V.* is occasionally met with, the ground color of which is a rich

black; the characteristic markings visible in particular lights, of a more intense black than the rest. A *Blue-bellied V.* has also been described, but differs little from the ordinary kind. A variety also occurs with the ground color dirty white, the markings jet black. The *Red V.* has the ground color brick-red, the markings rusty brown. It differs, however, from the ordinary kind in other particulars. There are some slight peculiarities in the markings, and the head is broader behind the eyes. The *Red V.* is found in some parts of the south of England.

The *V.* is the only venomous serpent found in Britain. Its bite is attended with much pain, and other serious consequences; but is seldom, if ever, fatal in Britain, although it is said to be so in warmer countries. The remedies employed for it are generally the external application of hot olive oil, and the internal use of olive oil and of ammonia, or strong stimulants such as brandy taken in large doses.

The *V.* inhabits heaths, dry woods, and dry banks. It preys on mice, frogs, small birds, and other small animals, which are killed by its poison-fangs, and swallowed entire. It hibernates during several months of the year, when many vipers may often be found entwined together in a torpid state. The poison is at this time inert, or nearly so. The *V.* is a good swimmer, and may occasionally be seen on lakes such as Loch Lomond, crossing from one island to another. The young are produced in the early part of summer, from twelve to twenty or more at a birth. The *V.* is ovo-viviparous, the eggs probably bursting in the act of parturition. Their investing membrane is so thin and slight as to be very easily torn. The young *V.* is coiled up so closely in the egg as almost to appear a solid mass, but the moment it is set free it becomes active, and is ready to throw itself into an attitude of defence. The heat of the mother's body is not sufficient for the development of the embryo, as in mammals, but that of the sun is required, and the pregnant female viper may often be found stretched out in the sunshine, more lethargic than in ordinary circumstances.

It has often been alleged that vipers swallow their young, to preserve them from danger—as, indeed, other serpents also are said to do—and there is nothing unreasonable in the supposition, as the young could live for some time in the stomach of the mother; but evidence is still wanting of the fact. The subject has been discussed, time after time, in publications devoted to natural history, but the original uncertainty still remains. Witnesses evidently truthful assert the fact, but eye-witnesses of the act of swallowing are wanted, the sum offered by Mr Frank Buckland, to whoever will bring a *V.* with the swallowed young in her stomach, to be by him dissected, never having been claimed. That young vipers issue from the body of a crushed *V.*, is easily accounted for, from what has been already stated.

The name *V.* (Lat. *Vipera*) is supposed to be a contraction of *Vivipara*, but the derivation is doubtful. The name adder (Scot. *Ether*, Old English *Eddre* or *Neddre*) is from the Anglo-Saxon *attor* or *ettor*, signifying poison, and hence a poisonous serpent.

Pliny, Galen, and other ancient writers, ascribe great medicinal virtues to broth made of vipers, and to the flesh of the animal. Vipers entwined together in hibernation were supposed to produce the *Ovum Anguinum*, to which great virtues were imagined to belong; and *snakestones* were at one time quite common in many parts of Britain, sometimes rounded pieces of stone, rather larger than marbles, sometimes glass beads of various forms, which were supposed to cure vipers' bites, and to be otherwise useful.

VIPERIDÆ, a family of venomous serpents, having the upper jaw toothless, but with movable fangs in front, no pit between the nostrils and eyes, the scales generally keeled, the tail short and tapering. More than twenty species are known, natives of Europe, Asia, Africa and Australia. No species has been found in America. To this family belong the Common Viper (q. v.) of Europe, the Horned Viper or *Cerastes* (q. v.) of Northern Africa, and the west of Asia, the Puff Adder (q. v.) of Africa, and the Death Adder of Australia. The Death Adder (*Acanthophis tortor*) differs from most of the *V.* in not having the scales keeled. It is widely diffused in Australia, where it is also known as the Black Snake. It is much dreaded, as its bite is said to be sometimes fatal in a quarter of an hour. It has two poison fangs on each upper jaw. The tail ends in a small recurved spine. The *V.* are most numerous in warm climates, in which also their bite is more deadly than in colder ones.

VIPER'S BU'GLOSS (*Echium*), a genus of plants of the natural order *Boraginæ*, having a calyx with five deep segments, an almost bell-shaped corolla, with dilated throat, and irregular limb, very long unequal filaments, and a bifid style. The species are large herbaceous plants or shrubs, rough with tubercles and hairs. Their flowers are often very beautiful. The **COMMON V. B.** (*E. vulgare*), a large annual plant, is a native of Britain and of most parts of Europe, growing in dry places, not unfrequently in corn-fields. Its flowers are at first reddish, and afterwards blue. It derives its name, **V. B.**, from spots on its stem, which somewhat resemble those of the viper; and the property of healing vipers' bites was therefore ascribed to it. Other herbaceous species are found in the south of Europe, North and South America, and other parts of the world. Shrubby species are found chiefly in the Canary Islands and in South Africa.

VIRCHOW, Rudolf, pathologist and publicist, was born in 1821 at Cöslin, in Pomerania. He was a pupil of the great physiologist, Johann Müller; graduated in medicine in 1843; and became, in 1847, prosecutor to the university of Berlin. The same year, he was commissioned by the government to investigate the cause and cure of typhus in Silesia; and also, in conjunction with Reinhardt, founded the *Annals of Pathological Anatomy and of Clinical Medicine*. The political commotions of 1848 dragged him, in common with many other votaries of science, into the revolutionary vortex. He established a journal entitled the "*Medical Reformer*," and also a democratic club, where he soon distinguished himself as an orator. He was, in consequence, elected a member of the National Assembly, but was not admitted because he was, in a parliamentary sense, a minor. With the conservative reaction, V. had his journal suppressed, and lost his post, but was elected to the chair of Pathological Anatomy in Würzburg. His lectures at that university were widely popular for the novel views which he struck out, particularly in cellular pathology. His reputation grew so great that he was recalled by Mantenffel, in 1856, to Berlin, where he re-occupied the chair of Pathological Anatomy, and rendered it the most famous of its kind in Europe. In 1859, when the liberal cause revived, he became member of the municipal council of Berlin, where he distinguished himself as a reformer of the arbitrary police system then rampant; and soon after, was chosen deputy by the electoral college of Santrübeck, and by two of the Berlin colleges. He soon rose to the leadership of the Opposition, and proved the most effective antagonist of the encroachments made in the name of the royal prerogative. He took the lead, in January 1863, in carrying the address in which the ministry were accused of having violated the constitution. Such was the energy of his opposition, that in June 1865 he was challenged to a duel by Count Bismarck. In 1879 he retired from parliamentary life, in order to devote himself exclusively to science, after having been for years a prominent member of the advanced liberals in the Reichstag. Among his works are his inaugural thesis, "*De Rheumate Cornæ*" (1843); "*The Colloid Tumors of the Ovaries, and on Cancer*" (1847); "*Cholera*" (1848—1849); "*Flexions of the Uterus, Scrofula, Tuberculosis, Typhoid Fever*" (1850); "*Cellular Pathology*" (1850); "*Amyloid Degeneration*" (1853); "*Morbus Spedalska*" (a disease peculiar to the Norwegian Coasts, 1859); "*Trichiniasis*" (1860); "*Tumors*" (1862); "*Cellular Pathology in its foundation on Physiological and Pathological Histology*" (1871); a notable article "*On the Standpoints of Scientific Medicine*" (1873). During the wars of 1866 and 1870—1871, V. took an active interest in the sanitary arrangements for the troops in the field. He was elected Honorary Member of the Royal Medical Society of London in 1866, and in 1869, Corresponding Member of the Medical Society of Paris.

VIRE, an ancient and pretty town of Normandy, France, in the dep. of Calvados, on the Vire, 85 miles s. w. of Caen. It stands on a rock, is built of granite, and is surrounded by hills, between which are the celebrated valleys of Vire—*Vaux de Vire* (see VAUDEVILLE). Pop. (1872) 6866.

VIRGILIUS (or, as it is more accurately spelt, Vergilius) Ma'ro, Publius, after Homer, the greatest epic poet of antiquity, was born in the consulship of Crassus and Pompey, on the 15th of October 70 B.C., at Andes, a village not far from Mantua. It is probable that his father was the proprietor of a small estate which was farmed by himself. V. was liberally educated, and is believed to have studied successively at Cremona and Mediolanum (Milan). In philosophy, he was instructed by Syron, an Epicurean, and one of his fellow-students was that Varus to whom his

sixth Eclogue is dedicated. Greek he learned at Neapolis (Naples) from the grammarian Parthenius. If we are correct in supposing that, in the first Eclogue, V. relates his own experience in the person of Tityrus, he first visited Rome 41 B.C., in his 30th year, for the purpose of reclaiming his lands, which were occupied by the soldiery of Octavianus, at the close of the war against the republicans. At Rome, he was introduced to Octavianus, through the influence of Pollio, or of some other patron, and further formed the acquaintance of his great protector, Mæcenas. He continued to compose his Eclogues—the tenth and last of which is dedicated to Gaius, and referred to the poet's 33d or 34th year. At the instance of Mæcenas, he commenced his "Georgics" in his 34th year, according to the grammarians, who also assign seven years as the time he spent in the composition of the work, which was carried on principally at Naples. The "Æneid" was his last performance, and must have occupied many of the latter years of his life. He went in 19 B.C. to Greece, where he meant to subject his great poem to a thorough process of revision and refinement; and his voyage to Athens was made by Horace the occasion of the ode (Book i. 8) commencing with "Sic te diva potens Cyprî." At Athens, V. met Augustus on his triumphal return from the East, and the poet was induced to go back to Rome in his company. He had only got as far as Megara, however, when he was seized with illness, which became worse on his voyage to Italy. On landing at Brundisium, or, according to another account, at Tarentum, he was unequal to the fatigue of travelling; and after lingering for a few days, he died in the 52d year of his age, 19 B.C. In compliance with his dying wish, his body was removed to Naples, and buried at the second milestone from that city, on the Puteolan Way. Pliny the Elder and Aulus Gellius are among the writers who say that on his deathbed V. desired his epic poem to be burned, rather than it should see the light in its imperfect state; but that the injunctions of Augustus to his executors, or, according to others, the interposition of his friends Tucca and Varus, who persuaded him to bequeath it to them on the understanding that it should remain unaltered, were the means of preserving it. This incident is quite in keeping with all that we know of V.'s modesty of character. The liberality of his patrons had endowed him with considerable property. He had a house on the Esquiline, near the gardens of Mæcenas, where he lived with an elegant simplicity, while he allowed the public free access to his excellent library. He was tall of stature, dark of complexion, and had the appearance of a farmer. His most finished poem is the "Georgics," in which the various departments of agricultural concern are described with great clearness, and illustrated by episodes of the finest poetry. His "Æneid" shews rather what he might have been than what he was as an epic poet. Unfinished as it is, however, its merits have always secured him a place in the front rank of epic writers; while, more than any similar work of antiquity, it has furnished a model to the epic and narrative poets of modern Italy. He has been edited and translated by scholars of nearly every country and period. The best English translation is that of the "Æneid" by William Morris (1875), which is on the whole superior to Dryden's, before unequalled. Conington's "Æneid" is in some features highly successful. The best editions are those of Heyne, Wagner, Forbiger, and Conington.

VIRGIL, the Magician, is the character in which the great Roman poet presented himself to the popular imagination of the middle ages. The origin of this singular delusion may be thus explained. From a very early period—almost, we may say, from the age in which he flourished—V. was acknowledged to be the prince of Latin poets. His poems threw all others into the shade, and this, not so much because they exhibited a finer and more original genius, as because their style was perfect, the subject of his *magnum opus* thoroughly national, and his immense historical and antiquarian lore devoted to the glorification of the Roman people. From him the grammarians selected the examples of their rules, and even composed treatises on special questions suggested by his poems. The rhetoricians, too, found there material for their themes and declamations, and the later poets imitated his phraseology. Very soon the idea sprang up that in his verses there lay hidden quite a peculiar wisdom and mystic meaning. Thus it happened, that as early as the 3d and 4th centuries, even Christian authors (e.g., Minutius Felix, Lactantius, and Augustine) had contracted the habit of regarding him reverentially, a feeling which in its turn induced them to use him for polemical, or at least theological

Virginals
Virginia

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purposes. Hence they sought to prove the beginning of the fourth Eclogue a Messianic prediction, and would have it that V. foresaw the day of Christ. This view rooted itself so deeply, that V. and the Sibyl (q. v.) were actually introduced into the liturgy of the church, along with the Messianic prophecies of the Old Testament, and in the "mysteries" of the middle ages, are frequently cited as bearing witness to a coming Messiah. Furthermore, when the first ages of polemical theology arrived, biblical critics and controversialists did not hesitate to quote the verses of V. in elucidation of passages of Scripture, and in confirmation of their views. Later still, some of the scholastics endeavored to give a "moral" significance to the whole "*Æneid*," and an epitome of sacred history even was manufactured out of its contents (see *CENTO*). Another use, or rather *mis-use* of the verse of V. had already begun during the Roman Empire, and affords additional evidence of the superstitious reverence that was gradually encircling the name of the poet: we allude to the custom of trying to discover one's fortune by selecting lines at random from his epic. See *SORTES BIBLICAS*, *SORTES VIRGILIANÆ*. Ultimately, as may be seen from the "*Divina Commedia*" of Dante, V. came to be considered as a representative of pure enlightened reason; a highly gifted genius standing midway between paganism and Christianity.

We have remarked that this deep, half-religious veneration for V. displayed itself at a very early period. Soon after his death, statues were erected to his memory, even in the domestic chapels of the emperors; the anniversary of his birth was held sacred; pregnant women and poets made pilgrimages to his tomb, and hence it became inevitable that all sorts of myths should spring up and attach themselves to his history; but the predominant conception in the middle ages was that of a wise, pure, and patriotic teacher, endowed with magic power and lore—quite a different kind of being from the evilly disposed and dreaded "sorcerer" of popular fancy. The Virgilian myths established themselves more especially in connection with the places where he was born, where he chiefly lived, and where he died—Mantua, Rome, and Naples; and there they even yet survive in some measure on the lips of the people. But, curiously enough, it was not from the Italians, but foreigners, that they first obtained literary consideration. The oldest document bearing on the subject of which we have any knowledge, is the "*Otia Imperialia*" of the Englishman, Gervase of Tilbury, who collected his stories from the mouths of the Neapolitan populace. A fuller account is to be found in the "*Chronicle*" of Arnold of Lübeck, who got his information from Conrad, Bishop of Hildesheim, Chancellor of the Emperor Henry VI. These were followed by their contemporaries, Helianthus, whose legendary history of V. is embodied in the 6th book of Vincentius Bellovacensis' "*Speculum Historiale*," and the English monk, Alexander Neckam, in his "*De Naturis Rerum*," the best parts of which (relating to V.) are preserved in the repeatedly published "*Vitæ Philosophorum*" of Guilelmus Buxanus. From these four main sources, the later Virgilian myth-mongers have chiefly borrowed: of whom the two chiefly deserving notice are Buonamente Alliprando (author of a *Chronicle* of Mantua in *terza-rima*, about the beginning of the 15th c.), and the so-called Pseudo-Villani (author of "*Le Croniche dell' incilta città di Napoli*" (Naples, 1526). Particular stories and allusions are found pretty thickly scattered through the whole literature of the middle ages after the 13th century. The first complete collection, however, of the Virgilian myths was the French "people's book," entitled "*Faictz Mareuilleux de Virgille*," published in the beginning of the 16th c., by Jehan Trepperel at Paris, translations of which soon after appeared in Dutch and English. Even the distant Icelanders had heard of the great magician, and there still exists in MS. an Icelandic "*Virgilius-Saga*." The greater part of the Virgilian myths collected in the "people's books" are of various ages and origin, and have come down to us in different forms. Some have decidedly been shaped after Eastern models, but the majority are of Latin and Italian growth—See Zappert, "*V.'s Fortleben im Mittelalter*" (Vienna, 1851); Stebenhaar, "*De Fabulis quæ Media Ætate de Virgilio circumferebantur*" (Berl. 1837); and Edélestaund du Meril, "*De Virgile l'Euchanteur*" in his "*Mélanges Archéologiques et Littéraires*" (Par. 1850).

VIRGINALS, a keyed instrument of former times. As described by Dr Burney, it resembled in form a small pianoforte, with a compass of four octaves, furnished with a quill and jack like those of the spinet, and a single string to each note. Queen Elizabeth is said to have been a skilful performer on the virginals;

but the instrument cannot, as popularly supposed, have been named in honor of the Virgin Queen, having been so called before her majesty's time.

VIRGINIA, one of the thirteen original United States of America, lies in lat. $36^{\circ} 31' - 39^{\circ} 27' \text{ n.}$ and long. $75^{\circ} 13' - 83^{\circ} 57' \text{ w.}$; bounded on the n. by Pennsylvania, Maryland, and West Virginia, e. by Maryland and the Atlantic, s. by North Carolina and Tennessee, and w. by Kentucky and West Virginia. Area, 38,362 sq. m., or 24,545,280 acres. It is divided into 99 counties. The chief towns are Richmond (the capital), Petersburg, Norfolk, Staunton, Waynesborough, Alexandria, Portsmouth, Lynchburgh, and Fredericksburgh. Chesapeake Bay, which divides the south-eastern portion of the state, affords deep and spacious harbors. The chief rivers are the Potomac, forming the north-eastern boundary; the James, York, Chickahominy, Rappahannock, Rapidan, Appomattox, Shenandoah, and the Nottoway and Roanoke, which empty into Albemarle Sound in North Carolina. Eastern V. is level or rolling land, rising gradually from the ocean and Chesapeake Bay. The western portion is hilly and mountainous; while through the centre from north-east to south-west run three ranges of the great Appalachian system of mountains: (1) a low range on the east, commencing with the Bull Run Mountains, near the Potomac; (2) the Blue Ridge, more elevated, through which the Potomac passes at Harper's Ferry, and which forms the eastern boundary of the Shenandoah Valley; (3) the great North Mountain and the Alleghany, which form for many miles the North-western boundary of V. The highest peak, White Top, in Grayson county, is 6000 feet. Other peaks rise from 4000 to 4500. The Valley of Virginia, or of the Shenandoah, is from 1200 to 1500 feet above the sea. The eastern coast is composed of tertiary sands, clays, and marls; further inland, strata of the miocene groups emerge from beneath these, and abut against granite gneiss, and other metamorphic rocks, at the line of the lowest falls of the principal rivers, the head of navigation, and sites of the chief towns. In the metamorphic belt are gold mines, copper, iron, &c. There are two upper secondary belts parallel to the Blue Ridge, crossing the James above Richmond, with rich coal deposits. The valley is of the Lower Silurian, with rich limestones, hematite iron, and a fertile soil. On the western borders are mineral springs (hot and cold), sulphur, salt, gypsum, lead, &c. The western coal region, cut through by large rivers, is one of the finest in the world. There are also deposits of fine marble, porcelain clay, fire-brick clay, fine granite, soap-stone, slate, &c. Among the curiosities are the Natural Bridge in Rockbridge county; Weir's Cave in Augusta county; Blowing Cave, which sends out a blast of cold air in summer, and draws in air in winter; flowing and ebbing springs; the Natural Tunnel, 70 feet high; and the Hawke's Nest, a pillar 1000 feet high. The climate of the east and south-east is hot with malaria in the swampy river-bottoms, producing bilious and remittent fevers; the higher regions are cold in winter, but a large portion of V. is pleasant and healthy. The soil of the eastern portion is light and good, but much exhausted by repeated tobacco-crops. The valley is rich, producing wheat, Indian corn, tobacco, and various fruits. The chief products are tobacco, flour, cotton, wool, coal, lumber, oysters, market-vegetables, and game. The internal commerce is carried on by the James River, several canals, and (1876) 1616 miles of railway. There is at Richmond a normal school for the training of teachers, which receives aid from the Peabody fund. The same fund assists a colored normal industrial school at Hampton. A system of free public schools, under the control of a board of education, a state superintendent, county superintendents, and district trustees, has been established in V., but its effective operation has been rather tardy. In 1870, trustees were appointed in ten out of ninety-nine counties, and a number of free schools were established. There are state institutions for blind, and deaf and dumb. The insane asylum is the oldest in the United States. The government is republican, with a governor and two houses of the legislature, elected by the suffrages of every male citizen, voting *virid voce*.

V., whose shores were first explored by Sebastian Cabot, 1498, and again under the auspices of Sir Walter Raleigh in the reign of Queen Elizabeth, in whose honor it was named, was first settled by an English colony, under the charter of the London Company, at Jamestown, on the James River, May 13, 1607—a colony consisting of gentlemen of fortune, and persons of no occupation, no families, twelve laborers, and very few mechanics. The friendly Indians sold them land and provisions; but the diseases of a damp climate swept off half the settlers the first autumn.

The energy of Captain John Smith saved the colony from destruction; and in 1609, it was reinforced with 500 persons, including 90 women and children, who were reduced by sickness and starvation to 60. They had embarked to abandon the settlement, when Lord Delaware came with emigrants and supplies. The marriage of John Rolfe to Pocahontas (q. v.) secured the friendship of the Indians. In 1619, 90 respectable young women were sent out from England, and sold to the planters for 100 lbs. of tobacco each; also 100 convicts, to supply labor; and a Dutch trader also sold them 90 negroes. In 1623, the colony was reduced by wars and massacres from 4000 to 3500; but in 1624 it became a crown colony, and increased, so that, in 1649, there were 15,000 English, with 300 "good negro servants," and 20 churches. The great production of tobacco caused such a fall in price, that half the crop was burned. In 1671, the population was 40,000, including 2000 black slaves, and 6000 English servants and redemptioners, of whom 1500 a year were imported. The now prosperous colony consisted of 48 parishes, but had, Governor Sir William Berkeley thanks God, no free schools or printing, which he hopes they may keep free of for a hundred years, and says: "God keep us from both!" In 1754, the colonial militia took part in the French war; and Major George Washington was in General Braddock's expedition. In 1769, Thomas Jefferson, a member of the House of Burgesses, which had been established in 1619, asserted for the colony the right of self-taxation, denying the right of parliament to tax the colonies. In 1773, Patrick Henry, Thomas Jefferson, and Richard Henry Lee were appointed a committee to confer with the other colonies, and urged upon their delegates the Declaration of Independence. V., the earliest settled, largest, and most populous of the thirteen original states, called the Old Dominion, has been called the Mother of Presidents, four out of the five before 1825 having been Virginians. She was the first to propose the confederacy and the constitution. In 1861, April 17, the legislature of V. passed the ordinance of Secession. The Confederate government was invited to Richmond, which became the centre of military operations. V. was restored to her place in the family of states on 26th January, 1870. See UNITED STATES. The pop. of V., in 1800, was 898,200, of which the slaves were 345,796; 1820, 1,065,379—slaves, 425,163; 1840, 1,596,818—slaves, 490,865; 1870, 1,225,177—and no slaves; 1880, 1,512,563.

VIRGINIA, West, a new state, separated from the above, and included in its boundaries and statistics, was admitted into the Union by act of Congress, approved December 31, 1862, but of disputed constitutionality, and taking effect June 20, 1863. The new state, separated from Virginia during the War of Secession, comprises 54 counties, lying west of the Alleghanies, having an area estimated at 23,000 sq. m., and a pop., according to the census of 1880, of 618,467. Capital (since 1875) and largest town, Wheeling. Abundance of water-power, minerals, and timber give W. V. great advantage for manufacturing. In 1870 there were 2444 manufacturing establishments, besides 194 mines.

VIRGINIA, University of, an institution of learning at Charlottesville, Albemarle county, Virginia, U. S., 4 miles from Monticello, the seat of Jefferson, by whom it was planned and organized. It was chartered by the state in 1819, and opened in 1825. It is governed by a rector and nine visitors. It has schools of ancient languages and history; modern languages, history, and literature; mathematics; natural philosophy; law; medicine; &c. The state pupils are free. Each student must attend three schools, and each school confers its own degrees. Those who have degrees in two or three schools receive the degree of Bachelor of Arts; those who take degrees in six schools receive that of Master of Arts. There were, in 1875—1876, 380 students. Library, 86,000 vols.

VIRGINIA, a city of Nevada, U. S., which has grown into importance with a rapidity that few even among American towns can parallel. Settled after 1860, it had in 1880 a population of 10,917, and its increase since then may be imagined from the fact that 10,000 people were left homeless by a fire which destroyed part of the city in 1875.

VIRGINIAN CREEPER. See *VITACEÆ*.

VIRGINIAN QUAIL, or Colin (*Oryz*), a genus of birds of the family *Tetraoidea*, closely allied to quails and partridges, but differing from both in having a shorter and thicker bill, and a rather more lengthened tail. They are all natives of

America. The best-known species is the VIRGINIAN COLIN (*O. Virginiana*), which is abundant in most parts of North America, and in some parts is commonly known by the name of Quail, in others by that of Partridge. In size, it is intermediate between the common quail and the common partridge of Britain. The prevalent color of the plumage is brownish red, the under parts whitish; but all parts are more or less mottled with different colors. The feathers of the head are capable of being erected into a sort of crest. The call of the male is popularly regarded as resembling the words, *Ah, Bob White!* The coveys of the V. Q. often approach houses in winter, and mingle with domestic poultry. Great numbers are killed by guns and taken in snares; and in the western and southern states many hundreds are often caught in a day by parties of men on horseback, who drive the coveys into a great cylindrical net. This bird is easily domesticated, and seems well fitted for the poultry-yard. It has been introduced into some parts of Europe, and may almost be regarded as naturalised, although still rare in England.—There are several other species of the genus in Mexico, California, and the north-west of America, of which one, the CALIFORNIAN COLIN (*O. Californica*), is remarkable for its long and beautiful black crest.

VIRGIN ISLANDS, a group of islands in the West Indies, partly belonging to Denmark, partly to Britain, directly east of Puerto Rico. The islands and islets are about 50 in number, but of these, only a few are of any considerable size or importance. Three of the islands, with an area in all of 119 sq. m., belong to Denmark—viz., St Thomas (see THOMAS, ST), St Croix (see CROIX, ST), and St John (with an area of 21 sq. m.); and the other islands, the chief of which are Tortola, Virgin-Gorda, Anegada, Vieque, and Culebra, belong to Great Britain. The area of the British possessions of the V. I. is 94 sq. m., or over 60,000 acres (Returns for 1871); and the pop. in 1871 was 6651, of whom 128 were white, 1963 colored, and 4565 black. The characteristic physical features are rugged heights and precipitous coast-lines, marked by numerous bays, havens, and creeks. Extensive tracts of land, possessed by the emancipated blacks, are covered with gulnea-grass, which forms good pasturage for cows, sheep, and goats. A valuable mine of copper has been worked at Virgin-Gorda; and gold, silver, and other valuable minerals are said to have been found; but the inhabitants obtain their livelihood chiefly by wrecking. In 1871, the revenue amounted to £2147, the expenditure to £2117. The value of the exports in the same year was £6267; of the imports, £4184. Cotton, sugar, ginger, and indigo are the principal products.

VIRGIN MARY. See MARY.

VIRGIN'S BOWER. See CLEMATIS.

VIRIATHUS, a Lusitanian (i. e., Portuguese) patriot, who energetically strove to prevent his country from falling under the dominion of the Romans. He flourished in the 2d c. B.C. Originally a shepherd, he afterwards became a guerrilla chief, and appears to have supported himself (like many of the Lusitanian borderers) by predatory excursions into the neighboring Spanish territory. This mode of life brought him into collision with Rome, and in the year 151 B.C., the propretor Ser. Galba, was ordered to invade the country, and reduce the Lusitanians to subjection. By an act of detestable treachery, Galba succeeded in destroying a large body of the natives; but the few who escaped (among whom was V.) were inspired with the most implacable animosity towards the Romans, and immediately proceeded to rouse the patriotic passions of their countrymen. V. soon rose into prominence. At first, he kept mainly to the mountains, and contented himself with harassing the enemy by sudden and fierce descents, but in 147 (having been formally chosen leader in a season of great peril), he gave battle to Vetilius, the Roman propretor, near Tribola (a town of Lusitania, south of the Tagus), and inflicted on him a severe defeat. In the course of the next two years he repeatedly came off victorious in conflict with Roman armies; until in 144, the consul, Q. Fabius Emilianus, encountered him in Andalusia with a large army of 15,000 foot and 2000 horse, and V. was driven back into his native fastnesses. But the Spanish tribes themselves now broke out in insurrection against their foreign masters; and after 143, the Romans had both a Numantine and a Lusitanian war to wage. The general sent against V. was the propretor, Q. Pompeius, who, after a slight temporary success, was utterly crushed at the "Hill of Venus," and forced to take refuge at Corduba

(in Andalusia), while the conqueror wasted all the country round the Guadalquivir. Next year (142), the Romans were more fortunate. Q. Fabius Servilianus, consul, conducted the war, and succeeded in driving V. once more out of Spain, and in annihilating several guerilla bands; but in 141, a terrible reverse befell him near Giscane, when the whole of his army was hopelessly surrounded in a mountain-pass, and the story of the Caudine Forks (q. v.) was repeated, by its unconditional surrender. V., like Calus Pontius, shewed a noble magnanimity in his hour of supreme triumph: he allowed his captives to go away free and unhurt, on condition of Servilianus allowing the Lusitanian to retain their independence, and accepting their alliance. His terms were accepted, and the Portuguese patriot seemed to have triumphed over his colossal adversary; but in 140, the consul, Q. Servilius Cæpio (brother of Servilianus), having received the command in Further Spain, suddenly and treacherously resumed the war against V., and fearing lest he should not succeed in fair fighting, bribed some Lusitanian envoys (who had been sent to him by V. with offers of peace) to murder their master, which they did while he lay sleeping in his tent. The death of this heroic chief was practically the ruin of Lusitanian independence; for though the followers of V. elected another leader in his place, and strove to carry on the war, they could scarcely maintain themselves in the field for the rest of the year, and were then glad to acknowledge the supremacy of the Romans.

VIRTUAL VELOCITY. See WORK.

VIRUS (the Latin word for a *poisonous liquid*) is a term used in medicine to signify those mysterious poisonous agencies which produce Zymotic Diseases (q. v.), such as smallpox, measles, scarlatina, the various forms of continued fever, ague, hooping-cough, cholera, syphilis, glanders, hydrophobia, &c. While each of these morbid poisons (as they are frequently called) has a definite and specific action, they collectively obey certain laws. For example (1.), their actions are variously limited, some affecting only one organ or system of organs, while others involve two or more organs or systems of organs. Thus, in brouchocele or goitre, we have an example of a poison acting only on the thyroid gland, while in hooping-cough and hydrophobia, all the organs supplied by the pneumogastric Nerves (q. v.) are affected, and, in paludal or malarian poison most of the organs. (2.) Morbid poisons, like medicines and ordinary poisons, have their period of latency, which, however, here is usually much prolonged. While a medicine, e. g., is seldom longer than a few hours in exhibiting its effects, the poisons of scarlatina, measles, and smallpox remain latent in the system for at least seven, ten, and sixteen days respectively; while that of paludal fever and hydrophobia may be dormant for a year or upwards. (3.) When several tissues or organs are acted on, the actions may be simultaneous, but are more commonly consecutive, a considerable interval often elapsing between the attacks. (4.) Another law of morbid poisons is, that two may co-exist in the same person: for example, small-pox and cow-pox have often been seen at the same time in the same person. In this case, each disease runs its course unaffected by the other; but most commonly, when two co-exist, one lies latent while the other runs its course. Thus, a case of intermittent fever may suddenly subside, and small-pox make its appearance; on recovery from this disease, the intermittent fever may return.

Amongst the peculiarities presented by morbid poisons, the following points must be noticed: (1.) In experiments made on the inoculation of the smallpox virus by Dr Fordyce, it was found that extremely diluted poison, if it acted at all, produced the same effects when introduced into the system as the concentrated virus. Hence it may be inferred that the intensity of the disease is not proportional to the amount of virus received into the system. (2.) Women in childbed may not only engender a special poison of this class—that of puerperal fever—but are highly susceptible of these poisons, and almost always succumb to their action. (3.) Another peculiar law of morbid poisons, and one wholly unknown in medicinal substances, is, as Dr Aitken remarks, “the faculty which the human body possesses of generating to an enormous extent a poison of the same nature as that by which the disease was originally produced. A quantity of smallpox matter not so big as a pin’s head will produce many thousand pustules, each containing fifty times as much pestilential matter as was originally inserted; and the miasmata secreted by one child

laboring under hooping-cough are sufficient to infect a whole city." A remarkable illustration of the development of syphilitic poison from a single infant over a whole province is given in the article *SYPHILIS*. (4.) A still more remarkable fact is, that many of these morbid poisons possess the property of never occurring more than once in the life of the same individual. This is the case with scarlatina, measles, smallpox, hooping-cough, and (to a less extent) typhoid and typhus fevers. (5.) This class of poisons is powerfully influenced by climate, and probably by the nature of the soil. Thus, the severe forms of typhus so common in this country are hardly known in warmer climates, and the influence of cold weather on cholera and plague are well known.—For further information on this subject, the reader is referred to Dr Robert Williams' "On Morbid Poisons;" and to the chapter on Zymotic Diseases, in the first volume of Aitken's "Science and Practice of Medicine," from which we have drawn most of the preceding remarks.

VISCONTI, a Lombard family which rose to sovereign rank in Northern Italy in the 13th c., and was equally distinguished by the share it took in the political contests of the Middle Ages, and by the services which it rendered to literature and science. The name *V.* is derived from the Latin *vice-comites*, and at first was merely the title of an office, but it gradually became a family surname, though when it came to be applied to this family authentic history fails to explain. The family descended, according to tradition, from Desiderius, the last king of the Lombards, and belonged to the feudal nobility of Northern Lombardy, having large estates near Lakes Como and Maggiore. The first who appears prominently in history is **ORTONE**, who became, in 1078, viscount of the archbishopric of Milan. The great Lombard families having, in course of time, split up into a multitude of lines, each in possession of a petty sovereignty, the *V.* on this account rose into comparative importance, more especially when, in 1238, another **ORTONE** was appointed archbishop of Milan by Pope Urban IV. This appointment being considered by the people an infringement of the rights of the chapter, was opposed by them; and their leader, Martino della Torre, and his successors, kept possession of the property of the see, and forced the archbishop to exile himself for 16 years. At last, the exiled Ottone advanced at the head of a body of exiles and emigrants upon Milan, defeated and captured his rival in a bloody and desperate conflict near Desio (January 21, 1277) and entered the city amidst the acclamations of the people, who hailed him as archbishop and perpetual lord of Milan. But he was not permitted to enjoy his newly-acquired dignities undisturbed, for, during the eleven years of his temporal sovereignty, he was engaged in almost uninterrupted warfare with the Torriani; and the contest was continued by his grand-nephew, **MATTEO**, who was chosen "captain of the people" in 1288, Ottone continuing in the archbishopric till his death in 1295. Matteo proved himself a prudent and temperate ruler, and his influential position was recognised by the Emperor Adolf, who created him imperial vicar in Lombardy. Expelled by the Torriani and their allies in 1302, he was restored in 1311 by the aid of the Emperor Henry VII., and reappointed imperial vicar in consideration of the payment of 40,000 florins; and Pavia, Alexandria, Tortona, Cremona, Bergamo, Lodi, &c., having been forced to acknowledge his authority, the family became more powerful than ever. Unfortunately, however, a quarrel arose with Pope John XXII. regarding the appointment to the Milan archiepiscopate; and Matteo, obstinately refusing to yield to the papal pretensions, was condemned as a confirmed heretic, and himself and his descendants stigmatised as perpetually infamous (March 14, 1322). The people, despite their profound esteem and affection for their ruler, were horror-struck at this solemn denunciation; and the feeling that so many of his friends were falling away from him so preyed on Matteo's mind, that he died in June 1323, three months after his excommunication. His son **GALEAZZO I.** was chosen his successor, and immediately the pope proclaimed a religious crusade against the heretical *V.*, and the "holy army" under Raymond of Cardona advanced, in 1323, on Milan, committing the most horrible ravages during its march. But though the *V.* could not directly oppose such an overwhelming force, Galeazzo's brother Marco, an able and experienced warrior, hovered round the disorderly host, cutting off detached parties; and the Emperor Lewis (of Bavaria) having sent a body of troops to aid the *V.*, the crusaders were driven back, totally defeated at Vavrio on the Adda (1334), and the remnant, with

their leader Cardona, captured. Soon after, Galeazzo, by the intrigues of his ambitious brother Marco, was perpetually exiled, yet his eldest son, Azzo V., succeeded him, while Pope Nicolas confirmed the third son, Giovanni, in the archiepiscopate—events which led Pope John XXII., for the sake of maintaining some authority over Milan, to recall the excommunication he had pronounced against the Visconti. Azzo was the greatest prince of the race, and ruled Milan wisely and well; devoting his attention to the improvement and embellishment of the city, in which labor he was aided by the painter Giotto (q. v.) from Florence, and the sculptor Balducci from Pisa. As great in war as in peace, he extended his sway over almost the whole of Lombardy; and on his death in August 1339, 8000 citizens of Milan voluntarily assumed the garb of mourning. The council-general of Milan elected his two uncles, the archbishop GIOVANNI and LUCCINO, as joint rulers in his stead; and on the latter, who was an able, resolute, and unscrupulous prince, wholly devolved the cares of the temporal sovereignty. Under his sway, Montferrat was added to the dominions of the V.; Pisa became tributary; a regular police was established; all offenders were punished with impartial severity; and a summary judgship of appeals (*assessorato*), open only to foreigners to prevent party bias, was established. But the vices of suspicion, lust, and revenge threw a deep gloom over Lucchino's eminent qualities, led him into the commission of many cruel and tyrannical acts, and indirectly caused his own death by poison in January 1349. From this time, the mild and peaceful archbishop reigned alone, availing himself of the assistance of his nephews in the more arduous tasks of government. He purchased Bologna for 200,000 florins in 1350; in 1353, accepted the lordship of Genoa, which had been almost crushed by its rival, Venice; and taking up the quarrel of his new subjects, equipped a fleet which, under Paganino Doria, gained a complete victory over the Venetians. He was the generous patron and friend of Petrarch, and the last good prince of the V. family. His three nephews conjointly succeeded him in October 1354; but in 1355, the eldest had died of poison, and his dominions were shared between the other two, GALEAZZO and BARNABO. Both princes were men of pre-eminent ability, but irreclaimably vicious, the latter being a very monster of cruelty. Bologna, which belonged to Barnabo, fell into the hands of the pope, who excommunicated Barnabo for attempting to recover it; but the V. prince laughed at the holy father's curse, and swore that he would be both pope and emperor in his own dominions. Innocent VI. then sent legates to him to propose terms, but the young savage compelled the unfortunate messengers to tear their master's bulls to fragments, and swallow them piece by piece. One of the legates, on becoming pope as Urban V., took revenge by proclaiming a crusade against Barnabo, which was joined by all the principal Italian princes; the Romagna and the borders of Lombardy were desolated by a long desultory strife; and though Barnabo was ultimately forced to accept a sum of money in place of Bologna, he took a humorous revenge on his ecclesiastical antagonists by compelling the clergy in his dominions to pay all the expenses of the war. One act of his, however, may be mentioned with commendation: he issued an edict forbidding even the mention of the names "Guelph" and "Ghibelline" under pain of having the tongue cut out; and his well-known stern adherence to such promises put an end to this long and mischievous controversy. His brother Galeazzo, who had established his residence at Pavia, was the "*Mæcenas*" of his time: he steadily befriended Petrarch; founded, under his direction, the University of Pavia; and collected a considerable library. The invention known as "*Galeazzo's Lent*," a system of torture calculated to prolong the victim's life for 40 days, stamps him with the family character of cruelty. On Galeazzo's death, his son, GIAN-GALEAZZO, succeeded (1378) him in Pavia and its dependencies; and by treacherously seizing and imprisoning his uncle Barnabo of Milan, became sole ruler of Lombardy. He had all the great qualities and most of the vices of his race, and openly aspired to the sovereignty of Italy; conquering Padua, Verona, Vicenza; extending his dominions to the gates of Florence, which he also attacked; and purchasing from the Emperor Wenceslas the absolute sovereignty of his dominions, with the title of *Duke of Milan*, for 100,000 gold florins. This curtailment of the empire, however, displeased Germany, but the Palatine Ruprecht, who invaded Lombardy, received such a lesson from the condottieri of Alberico da Barbiano at Brescia, as caused him to gladly seek the north side of the Alps. Florence, the only remaining obstacle to the accomplishment of the

V.'s ambitious scheme, was on the point of surrendering, when Gian died of the plague in 1402. He was a great patron of letters and science, gathered eminent men of all classes around him, reorganised the university of Piacenza, established a magnificent library, constructed the famous bridge over the Ticino at Pavia, and commenced the erection of the cathedral of Milan. His daughter Valentina married Louis, the younger brother of Charles VI. of France, and became grandmother of Louis XII., who upon this relationship founded his claims to the Milanese. His sons, GIAMMARIA V. (Giovanni-Maria) and FILIPPO-MARIA V., reigned in succession; but the former, who was cowardly, suspicious, and of a cruelly partaking of insanity, was, in the interests of his subjects, stabbed to death, May 16, 1412; and the younger brother, equally timorous and suspicious, and of only average cruelty, became sole ruler. The Venetians on the east, the Marquis of Montferrat on the west, and the pope on the south, were rapidly curtailing his dominions, when, by a happy stroke of policy, he espoused Beatrice di Tenda, the widow of a condottieri leader, and thus obtained the services of a veteran band of soldiers. His fortunate choice of Carmagnola (q. v.) as his general led to the restoration of the former boundaries of his dominions; and on his quarrel with the soldier who had served him so well, he was sagacious enough to supply his place by others as nearly equal in ability as could be obtained. In 1441, he engaged the services of Francesco Sforza, to whom he gave his natural daughter Bianca in marriage; and on his death in 1447, the V. family was succeeded by that of Sforza (q. v.) in the lordship of the Milanese. Collateral branches of the V. still exist in Lombardy.—See Lilla's "Famiglie Celebri Italiane," Verri's "Storia di Milano," and Muratori's "Annali d'Italia."

VISCONTI, a family of archaeologists and architects, the first of whom to rise to prominence was GIOVANNI BATTISTA V., a native of Sarzana, who settled at Rome, and after making for himself a great name as an archaeologist, succeeded Winckelmann as prefect of the antiquities of Rome. He was employed by Clement XIV. and Pius VI. to collect works of ancient art for the Museum of the Vatican ("Museo Pio Clementino," as, from its two principal benefactors, it was called); and afterwards, in 1778, commenced the writing of the letter-press which was intended to accompany the series of engravings of that splendid collection. He died in 1784.—ENNIO-QUIRINO V., eldest son of the former, was born at Rome, November 1, 1751, and was educated by his father, who intended him for the church. This profession, however, he afterwards refused to adopt, and was for a time disowned by his father. But at last, in 1778, the old man was glad to call his son to his aid, and together they prepared the first volume of the engravings of the "Museo Pio Clementino." In 1784, he edited alone the second volume of the same series; he was also appointed conservator of the Capitoline Museum. The series of engravings of the "Museo" was regularly issued, the seventh and last volume being published in 1807. When Rome fell into the hands of the French, V. became a member of the provisional government, and afterwards one of the five consuls; but in November 1799, the arrival of the Neapolitan army forced him to emigrate to France, and from this time he settled at Paris. His great reputation as an archaeologist having been long recognised among the learned men of the French capital, he was made an administrator of the Louvre, and Professor of Archaeology; and drew up a catalogue of the works of art in the new museum (many of the items being his old familiar acquaintances of the Vatican), which, from the frequent raids of Napoleon on foreign collections, required to be frequently re-edited and enlarged. In 1804, he was requested by the emperor to select and publish a series of portraits of the distinguished men of ancient Greece and Rome; and this, probably the greatest of his works, appeared in two parts, "Iconographie Grecque" (3 vols. 4to, 1808) and "Iconographie Romaine" (1 vol. 4to, 1817). Contemporaneously, V. issued from time to time papers and dissertations on particular objects of ancient art. In 1815, he came to London by express desire of the British government, to fix a fair price for the Elgin Marbles (q. v.), and on his return wrote a Memoir explanatory of these sculptures. His last work was to complete his "Illustrazioni di Monumenti scelti Borghesiani" (Rome, 1821). He died after a long illness, February 1818, and his death was a source of grief to the learned throughout Europe, many of whom came from great distances to attend his funeral. Besides his immense antiquarian knowledge, V. possessed an extensive acquaintance with the history, languages, mythology, and manners of the classic age. A complete collection of his works was commenced at

Viscount
Vishnu

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Milan in 1818, but has not been completed. See "Antologia" of Florence, No. 18; Tipaldo's "Biografia degli Italiani Illustri;" and Maffei's "Storia della Letteratura Italiana."—His younger brother, FILIPPO AURELIO, was also an eminent archaeologist, and was president of the commission of antiquities and fine arts at Rome from 1809 to 1814. He edited the "Museo Chiaramonti," a sequel to the "Museo Pio Clementino," and published several other works; but his chief attention was bestowed upon numismatology. He died at Rome in 1830.—LOUIS-JOACHIM V., the son of Euno Quirino, was born at Rome in 1797, and after a careful education at Paris, was apprenticed to an architect. His progress in his profession was rapid, as he was appointed an inspector of public buildings as soon as his apprenticeship had expired, and shortly afterwards became one of the architects and surveyors of Paris, and architect of the Bibliothèque Royale in 1835. His works include various public monuments in honor of eminent Frenchmen, some of the first fountains of Paris, the tomb of Napoleon I., and various hotels and private residences, the chief of all being the plans for the completion of the Louvre on a most magnificent scale. V. died at Paris, 29th December 1868.—The nephew of the preceding, PIERRE-HERCULE V., is a celebrated archaeologist, and Professor of Archaeology in the National Academy of France, at Rome.

VISCOUNT (Lat. *vice*, in place of, and *comes*, earl), originally the officer who acted as deputy to the earl, the earl being the king's immediate officer within his county. When the title of earl, originally personal, became hereditary, which took place in England under William the Conqueror, a deputy had necessarily to be appointed in all cases where he was a minor, or otherwise incapacitated from discharging the duties of his office. This deputy gradually became a permanent officer, otherwise known as the Sheriff, whose Latin designation continued to be *vicecomes*. The hereditary title of viscount is a degree of nobility unconnected with office. It was first granted in England to John Beaumont, created a peer by the title of Viscount Beaumont in 1440. A viscount is now the fourth degree of nobility in the United Kingdom. His coronet consists of a chased circlet of gold, round which are ranged an indefinite number of pearls, nine of them being most generally shewn, smaller than those of a baron's coronet, and in contact with each other. The mantle is scarlet, and has two doublings and a half of ermine. A viscount is styled "Right Honorable;" his wife is a viscountess; his eldest son has no courtesy title of peerage; but all his sons and daughters are styled "Honorable."

VISCUM. See MISTLETOE.

WISE (*Escalier à Vis*), a spiral or corkscrew staircase, the steps of which wind round and rest on a perpendicular pillar, called the Newel (q. v.). In the Norman style, the steps rested on a spiral arch; but in later times, the steps were formed of single stones, stretching from the newel to the wall. This kind of staircase was that most generally used in medieval buildings.

VISEU, an episcopal city of Portugal, in the province of Beira, stands in a wide, fruit-producing plain, at the height of 1300 feet above sea-level. 50 miles north-east of Coimbra. Its cathedral is a striking flamboyant edifice, and contains a number of excellent pictures by Gran Vasco, the Portuguese Fra Angelico. In the vicinity is the Roman camp, called Cava de Viriato. The town, which is one of the oldest in the country, contains other Roman as well as Gothic and Moorish remains. A large fair is held here. Pop. 9160.

VISHNI-VOLOTCHE'K, a town of Russia, in the government of Tver, about 220 miles south-east of St Petersburg by railway. It is situated on the Tzva, on the Vishni-Volotchek water-route constructed by Peter the Great, and connecting the navigation of the Baltic and Caspian Seas, by means of the Volga, &c. There is a very extensive transit-trade. An immense quantity of corn passes through the town every year. Pop. (1867) 15,133.

VISHN'U is the second god of the Hindu triad, but is considered by his worshippers to be the supreme deity of the Hindu pantheon. See TRIMŪRTI and VAISHN'AVAS. The word is derived, by *Sankara* (q. v.), in his commentary on the thousand names of V., and by other commentators after him, from *vish*, encompass, or *vis'*, penetrate; when, according to them, it would imply the deity who encompasses or penetrates the whole universe, both as regards its exterior appearance and its inward

essence. A similar etymology is assigned to the word by *Yāska* (q. v.) in his gloss on the R'igveda; but as in this Veda, V. does not yet embody the notions connected with him at the epic and Purāṇic period of Hinduism (see INDIA, sec. *Religion*), *Yāska* does not impart to the name the implied sense given to it by the commentators just mentioned. In the R'igveda, V. is a representation of the sun, who "strides through the seven regions of the earth," and "in three ways plants his step" (or, as *Yāska* explains, plants his step so as to become threefold). And, according to one predecessor of *Yāska*, these three steps mean the manifestation of the sun at its place of rising, on the meridian, and at its place of setting; or, according to another, its manifestation on earth, in the intermediate space, and in heaven; when—as a later commentator observes—in the first of these manifestations, V. represents fire; in the second, lightning; and in the third, the solar light. From this position which V. holds in the R'igveda (see *VEDA*), it results that he was not regarded there as supreme, or even as equal, to other deities, who, at the Vedic period, occupied a foremost rank. He is extolled in several hymns as having "established the heavens and the earth," as "being beyond mortal comprehension," and so forth; but he is there also described as having derived his power of striding over the world from *Indra* (q. v.), and as celebrating the praises of this god. He is frequently invoked together with the latter, but apparently always as inferior to him; and often, too, he occurs in company with a number of other gods, such as *Varuṇa*, the Maruts, *Rudra*, *Vāyu*, the luminous deities called *Adityas*, and others, without any distinction being drawn in their respective rank. Fewer hymns, moreover, are separately devoted to his praise than to that of *Agni*, *Indra*, or other prominent gods of the Vedic period; and it deserves notice, too, that at that period he was not yet included amongst the *Adityas*, for only at the epic period, when a number of these deities, originally varying from six to eight, was raised to twelve, V. was included in it—he then being named as the foremost of these luminous offsprings of *Aditi*, or space.

Although some of the Brāhmanas of the Vedas (q. v.) already shew the progress which the solar V. had made in the imagination of the people, and although they contain the germ of several legends, which, at a later time, became fully developed, the really mythological character of this god, as the basis of the divine worship now paid him by a large class of the Hindu population, belongs to the epic poems—the "*Rāmāyaṇa*" and "*Mahābhārata*" (q. v.)—and to the "*Purāṇas*" (q. v.). In the *Mahābhārata*, V. is often identified with the supreme spirit; but while in some portions of this poem—the different parts of which belong to different epochs of Hindu antiquity—he is thus regarded as the most exalted deity; he is again, in others, represented as paying homage to *Śiva* (q. v.), the third person of the Trimūrti, and as acknowledging the superiority of this god over himself. Taking, therefore, the *Mahābhārata* as a whole, he does not occupy, in this epoc, the exclusive supremacy which is assigned to him in the *Rāmāyaṇa*, and still more in those *Purāṇas* especially devoted to his praise.

The large circle of myths relating to V., in the epic poems and *Purāṇas*, is distinguished by a feature which, though not quite absent from the mythological history of *Śiva*, especially characterises that of Vishnu. It arose from the idea, that whenever a great disorder, physical or moral, disturbed the world, V. descended "in a small portion of his essence" to set it right, to restore the law, and thus to preserve creation. Such descents of the god are called his *Avatāras* (from *ava* and *trā*, descend); and they consist in V.'s being supposed to have either assumed the form of some wonderful animal or superhuman being, or to have been born of human parents, in a human form, always, of course, possessed of miraculous properties. Some of these *Avatāras* are of an entirely cosmical character; others, however, are probably based on historical events, the leading personage of which was gradually endowed with divine attributes, until he was regarded as the incarnation of the deity itself. With the exception of the last, all these *Avatāras* belong to the past; the last, however, is yet to come. Their number is generally given as ten, and their names in the following order: 1. The fish; 2. The tortoise; 3. The boar; 4. The man-lion; 5. The dwarf; 6. The Paras'u-Rāma; 7. The Rāma-baudra, or, briefly, Rāma; 8. The Kṛishṇa and Balarāma; 9. The Buddha; and 10. The Kalki or Kalkin-Avatāra. This number and enumeration of *Avatāras*, however, was not at all times the same. The *Mahābhārata*, though also mentioning ten, names successively the Hanse, tortoise, fish, boar, man-lion, dwarf, Paras'u-Rāma,

Rāma, Śātvata-, and Kalkin-Avatāras. The Bhāgavata-Purāṇa speaks of twenty-two Avatāras of V., which, for instance, also comprise Prithu (q. v.), Dharmavārti, the god of medicine, and Kapila, the reputed founder of the Sāukhya (q. v.) philosophy. Other works have twenty-four Avatāras, or even call them numberless; but the generally-received Avatāras are those ten mentioned before, an idea of which may be afforded by the following brief account.

1. The *Matasya*- or *fish-Avatāra*.—When, at the end of the last mundane age, the Bhāgavata-Purāṇa relates, Brahman, the first god of the Trimūrti, had fallen asleep, a powerful demon, *Haya-grīva*, stole the Vedas which had issued from the mouth of Brahmā, and lay by his side. About that time, a royal saint, *Satyavrata*, had by his penance attained the rank of a Manu, and V. who had witnessed the deed of *Haya-grīva*, and intended to slay him, assumed for this purpose the form of a very small fish, and glided into the hands of the saint when the latter made his daily ablutions in the river. Manu, about to release the little fish, was addressed and urged by it not to expose it to the danger that might arise to it from the larger fish in the river, but to place it in his water-jar. The saint complied with its wish; but in one night the fish grew so large, that at its request he had to transfer it to a pond. Yet soon the pond also becoming insufficient to contain the fish, Manu had to choose a larger pond for its abode; and, after successive other changes, he took it to the ocean. *Satyavrata* now understood that the fish was no other than *Nārāyaṇa* or V., and, after he had paid his adoration to the god, the latter revealed to him the immensity of a deluge which would destroy the world, and told him that a large vessel would appear to him, in which he was to embark together with the seven Rishis, taking with him all the plants and all the seeds of created things. Manu obeyed the behest of the god; and when the water covered the surface of the earth, V. again appeared to him in the shape of a golden fish with a single horn, 10,000 miles long; and to this horn Manu attached the vessel, by means of V.'s serpent serving as a cord. While thus floating in the vessel, Manu was instructed by the fish-god in the philosophical doctrines and the science of the supreme spirit; and after the deluge had subsided, the fish-god killed *Haya-grīva*, restored the Vedas to Brahman, and taught them to the Manu *Satyavrata*, who in the present mundane age was born under the name of *S'rāddhadeva*, as the son of *Vivasvat*.—A fuller account of this Avatāra is given in the "*Matasya-Purāṇa*," where the instruction imparted to Manu by the fish-god includes all the usual detail contained in a Purāṇa (q. v.), that relating to creation, the patriarchs, progenitors, regal dynasties, the duties of the different orders, and so forth. In the *Mahābhārata*, where the same legend occurs, but without either that portion concerning *Haya-grīva*, or the instruction imparted by the fish, there is, besides minor variations, that important difference between its story and that of the Purāṇas, that the fish is not a personification of V., but of Brahman, and that the deluge occurs in the present mundane age, under the reign itself of the Manu, who is the son of *Vivasvat*.—The origin of this Avatāra is probably a kindred legend, which occurs in the "*S'atapathabrāhmaṇa*," of the White Yajurveda (see VEDA); but there the fish does not represent any special deity, and the purpose of the legend itself is merely to account for the performance of certain sacramental ceremonies.

2. The *Kūrma*- or *tortoise-Avatāra*.—When, of old, the gods felt their powers impaired, and were desirous of obtaining *Amṛta*, the beverage of immortality, V. directed them to churn, together with the demons, the milk-sea, by taking the mountain *Mandara* for their staff, and his serpent *Vāsuki* for their cord, the gods to stand at the tail, and the demons at the head of the serpent; while he himself consented to support the mountain on his back, after having assumed the shape of a gigantic tortoise. The result of this churning of the sea of milk, was, besides the ultimate recovery of the *Amṛta*, the appearance of a variety of miraculous things and beings; but it also led to a violent contest between the gods and demons, in which the latter were defeated. See RĀMU.—The idea of the lord of creation assuming the shape of a tortoise, and that of sacrificial liquids, especially clarified butter, becoming tortoise-shaped (*Kūrma*, the word for tortoise, meaning literally, "badly or slowly going"), occurs also in the Yajurveda; but the legend on which the tortoise-Avatāra of V. is based seems to belong entirely to the post-Vedic period of the Hinduism.

3. The *Varāha*- or *boar-Avatāra*.—It is supposed to have taken place when, at

the period of creation, the earth was immersed in water, and V., in order to raise it up, assumed the form of a gigantic boar. In the earlier recension of the *Rāmāyaṇa* and the *Līṅga-Purāṇa*, it was Brahman, the creator of the universe, who transformed himself into a boar for rescuing the earth from its imperilled position; and in the "Black Yajurveda," where this idea is first met with, it is likewise said that the lord of creation upheld the earth, assuming the form of a boar. At a later period, however, this Avatāra is generally attributed to Viṣṇu. Between both conceptions there is, however, also this great difference, that in the former the transformation of the deity into a boar has apparently a purely cosmical character, whereas in the latter "it allegorically represents the extrication of the world from a deluge of iniquity, by the rites of religion." (Wilson's translation of the "Viṣṇu-Purāṇa," second ed., by F. Hall, vol. i. p. 59, note.) For the boar, as an incarnation of V., is the type of the ritual of the Vedas. He is described as the sacrifice personified; his feet being the Vedas; his tusks, the sacrificial post to which the victim is tied; his teeth, the sacrificial offerings; his mouth, the altar; his tongue, the fire; his hairs, the sacrificial grass; his eyes, days and night; his head, the place of Brahman; his mane, the hymns of the Vedas; his nostrils, all the oblations; his snout, the ladle of oblation; his voice, the chanting of the Sāmaveda; his body, the hall of sacrifice; his joints, the different ceremonies; and his ears, as having the properties of voluntary and obligatory rites ("Viṣṇu-P.", vol. i. p. 68); and similar descriptions of the boar occur in the Harivaṇ'sa (q. v.) and elsewhere; besides those relating to the immense size and wonderful appearance of the mysterious animal. In the "Bhāgavata-Purāṇa," another legend is also connected with this incarnation of V., still more distinctly proving that, at the Purāṇic period, it was viewed in a purely religious light. According to this legend, *Jaya* and *Vijaya*, two doorkeepers of V., once offended some Muṇis who claimed admission to the paradise of V., and in consequence were doomed to lose their position in V.'s heaven, and to be reborn on earth. They became thus the sons of *Kaśyapa* and *Diti*, under the names of *Hiraṇ'yakāśipu* and *Hiraṇ'yāksha*. The former subdued the three worlds, and the latter went straight to heaven, to conquer also the gods. Thus threatened in their existence, the gods implored the assistance of V.; and V., who at that period was the mysterious or primitive boar, slew Hiraṇ'yāksha. A similar contest between V. as boar and numerous demons, the progeny of Diti, always ending in the defeat of the latter, is also described in the "Mokṣadharmas," one of the later portions of the *Mahābhārata*; and from this and similar descriptions, it follows that the boar-Avatāra had gradually lost its original character, and assumed that common to the remaining Avatāras, of representing the deity as becoming incarnate, for the purpose of remedying moral or religious wrong, or of destroying influences hostile to the pretensions of the Brāhmanic caste.

4. The *Nṛsiṃha*- or *man-lion-Avatāra*.—Hiraṇ'yakāśipu, the brother of the demon Hiraṇ'yāksha just mentioned, had resolved to become a sovereign of the three worlds, and exempt from death and decay. To attain this end, he practised severe austerities, and ultimately received from Brahman, as the desired reward, a promise that he should become a supreme ruler, and death should not accrue to him from any created being, neither within his abode nor without, neither by day nor by night, neither in heaven nor on earth, nor by any kind of weapon. Possessed of the grant of this boon, he now gave course to the hatred he had conceived against V. for having killed his brother Hiraṇ'yāksha. He oppressed all the gods, robbed them of their shares in the sacrifices, and threatened their destruction. But he had a son, *Prahāda* or *Prahāda*, who, through his religious studies and pious conduct, had become a devout worshipper of Viṣṇu. When Hiraṇ'yakāśipu became aware of his son's partiality for this god, he first endeavored to impart to him his own hostile feelings against V., but failing in this, resolved to kill him. All the means, however, he employed to this end remained vain; and when at last, Hiraṇ'yakāśipu, about to cut off the head of his son, sneeringly asked him why V., who, as he asserted, was everywhere, should not be present also in a pillar in the hall, which he struck with his fist, V. suddenly made his appearance in the shape of a being neither man nor animal, in that of a man-lion of fearful aspect and size; and after a violent struggle with the demon, killed him in tearing his heart out with his finger-nails. Prahāda was then installed by him as sovereign over the demons and, at the end of a pious reign, obtained final liberation.

5. The *Vāmana*, or dwarf-*Avatara*.—Prahāda's son was Virochana, and his son was Bali. The latter, after having conquered Indra (q. v.) ruled over the three worlds, and filled the gods with dismay for their future prosperity. They had, in consequence, recourse to V.; and when, at one time, Bali was celebrating a grand sacrifice, V., assuming the shape of a dwarf, humbly approached the demon king. Pleas'd with the devout and unpretending appearance of the little Brāhman, Bali asked him to demand a boon, however costly it might be. The dwarf, however, merely ask'd for so much ground as he could measure with three paces. The king smilingly granted so modest a request, though his family priest *Usanas*, suspecting the true nature of the dwarf, strongly dissuaded him from doing so. But when the dwarf had obtained what he asked for, he strode with one pace over the earth, with a second over the immediate space (the atmosphere), and with a third over the sky, thus leaving for Bali only the subterranean regions, which he assigned him for his future abode. The demons endeavored to frustrate this result, after V. had taken his first two strides, but they were overcome by the followers of V.; and Bali, when resigning himself to his fate, in reply to a reproach addressed to him by the dwarf for trying to break his promise, uttered—according to the *Bhāgavata-Purāṇa*—the following words, which may serve as one of many instances to show how sacred a promise was held by the Hindus when once given, and even though artfully obtained: "If, renowned chief of the gods, you consider the word which I uttered to be deceitful, I now do what is sincere, and can be no deception—place your third step on my head. Fallen from my position, I fear not the infernal regions, or binding in bonds, or misfortune difficult to escape, or loss of wealth, or your restraint, so much as I am afflicted by a bad name." See J. Muir's "Original Sanscrit Texts," vol. iv. p. 128.) For his righteousness, he was then rewarded by V. with the promise, that after a temporary residence in one of the most delightful places of *Pātālā* (q. v.), he should be born as the Indra, in the reign of the eighth Manu. In this incarnation as dwarf, V. is considered to have been a son of the same Kasyapa who is also the father of Hiran'yakāsh'ipu and Hiran'yakāsha; but while their mother is Diti, the dwarf's mother is Aditi (space); and since she previously had brought forth Indra, V. is sometimes called Upendra, or the younger or later Indra. As a son of Aditi, V. becomes one of the Adityas (see before).—The Vedic conception of the three strides of V., as mentioned in the beginning of this article, is doubtless the basis of the idea whence this *Avatara* arose.

6. The *Paras'u-Rāma-Avatara*, or V.'s incarnation as Rāma, the son of Jamadagni, armed with an axe (*paras'u*). Arjuna, a son of *Kṛtāvīrya*, and king of the Haihayas, had obtained, as a reward for his piety, a thousand arms, and the sovereignty over the earth. The gods, frightened at his power, had recourse to V., and the latter resolved to be born as a son of Jamadagni, that he might slay him. Jamadagni was the son of *Richika*, of the race of *Bhr'gu*, a pious sage who had married *Ren'ukā*, the daughter of king *Prasenajit*, and had obtained five sons by her, the last of whom was Rāma, or V. incarnate in this form. *Ren'ukā* having once, for some supposed impropriety, incurred the anger of her husband, at his bidding, killed by her son Rāma, but at the request of the latter, again restored to life; and her first four sons were likewise saved from the consequence of the wrath of Jamadagni by the intercession of their brother Rāma. After this event had happened, or, as one account goes, previously to it, Arjuna came to the hermitage of Jamadagni, and was there hospitably received by the saint, who could treat him and his followers sumptuously, as he possessed a fabulous cow of plenty, that not merely supplied him with the milk and butter required for his sacrificial offerings, but with everything else he wished for. Struck by the precious qualities of this cow, and in spite of the kind treatment he had met with, Arjuna carried off with him the cow and her calf. When Rāma, who, on this occasion, had been absent from home, returned to the hermitage, and learned what had happened, he took up his axe (or, as the *Mahābhārata* says, his bow), and slew Arjuna, together with his army. The sons of the latter, to revenge their father's death, after some time, attacked the hermitage, and succeeded in killing Jamadagni. Thereupon, Rāma made a vow to extirpate the whole Kshatriya or military race; and not satisfied with destroying the sons of Arjuna, he killed every Kshatriya whom he encountered afterwards. In this manner, the legend concludes, "he cleared thrice seven times the earth of the Kshatriya caste"—killing the men of so many generations as fast as they grew to

adolescence—"and filled with their blood the five large lakes of Samantapanchaka, from which he offered libations to the race of Bhr'gu." He then performed a solemn sacrifice, and distributed the land and many riches amongst the ministering priests. The *Mahābhārata*, which on two occasions relates this legend, in one place enumerates the Kshatriyas who escaped the destruction of their caste, and from whom the lines of the kings hereafter were continued; this account, however, is inconsistent with Purāṇic lists, in which the royal lineages are uninterrupted. There can be little doubt that a real historical conflict between the Brāhmaṇas and Kshatriyas underlies the conception of this Avatāra; one which has its parallel in the history of Vaisht'ha and Vis'wamitra (q. v.).

7. The *Rāmachandra*—or, briefly, *Rāma-Avatāra*.—*Rāvan'a*, a king of *Lankā*, or Ceylon, a monster with ten heads and twenty arms, had, by dint of austerities, obtained from Brahman the promise that neither gods or demons should be able to take his life. In consequence, he oppressed the whole universe: the sun dared not shine hot, or the fire burn, or the wind blow, where he stood, and the ocean, when it saw him, became motionless. The gods, thus seeing the world and their own existence endangered, implored Brahman to protect them; and he, remembering that the demon, when asking for the boon he had granted him, omitted to include men among the beings that should not hurt him, advised the gods to pray to V. to become incarnate. This they did, and V. granted their prayer. At that time, *Das'aratha*, a king of Ayodhya, of the solar line of Hindu kings, performed the great horse-sacrifice in order to obtain sons; for though he had three wives, *Kaus'alyā*, *Sumitrā*, and *Kaikeyī*, he was without male progeny. This sacrifice became successful, for, when on the point of completion, a supernatural being appeared to him with a divine beverage, one-half of which he was to give to *Kaus'alyā*, one-fourth to *Sumitrā*, and the remaining fourth to *Kaikeyī*. And as this nectar which he gave them contained the divine essence of V., *Rāma*, the son whom *Kaus'alyā* brought forth, became one-half, the twins *Lakshman'a* and *S'atrughna*, born by *Sumitrā*, together one-fourth, and *Bharata*, the son of *Kaikeyī*, another fourth, of the substance of Vishn'u. While *Rāma* and his brothers were still boys, the sage *Viswamitra* (q. v.) came to the court of *Das'aratha*, requesting him that he should allow *Rāma* to proceed to his hermitage, in order to destroy there the *Rākshasas*, or fiends, who infested it, and disturbed his sacrificial rites. Though reluctantly, *Das'aratha* gave his consent to his departure; and *Rāma*, accompanied by his brother *Lakshman'a*—who, throughout his brother's career, remained his faithful companion and ally—started on his first eventful journey; for it was marked by a number of wonderful exploits which he performed in killing the demons, and which already then revealed his divine mission. Having fulfilled the desire of *Viswamitra* he proceeded to *Mithilā*, where King *Janaka* held a great assembly of kings, having promised to give in marriage his daughter *Sītā* (q. v.) to the prince who would be able to bend the bow with which *S'iva* (q. v.) once conquered the gods at the sacrifice of *Daksha*, and which now was in his trust. Yet so large and heavy was this bow, that not even the strongest of them could so much as move it. But when *Rāma* arrived, and the bow was shown him, he lifted it up and bent it, as it were in sport, and ultimately even broke it in the middle. *Śikā* became thus the wife of *Rāma*; while *Janaka* gave *Urmilā* to *Lakshman'a*, *Mān'dasī* to *Bharata*, and *Srutakṛitī* to *S'atrughna*. (In his way home, *Rāma* met *Paras'urāma* (see the sixth Avatāra), who, having heard of his namesake's bow-feat at the court of *Janaka*, challenged him to bend also the bow of V., which he had received from his father, *Jamadagni*, and if he could do so, to a single combat. *Rāma*, displeased with the doubt of *Paras'urāma* in his strength, immediately seized the bow, bent it, and would have killed the son of *Jamadagni*, had he not respected his quality as a Brāhmaṇ: still, he destroyed the worlds which the latter had acquired by his penance, and thus excluded him from heaven. (This account given of the meeting of the two *Rāmas*, in the *Rāmāyan'a*, would seem to shew that at the time when this poem was composed, the *Paras'urāma* was not yet conceived as an incarnation of V., since he is represented in it as jealous of the defeat which *S'iva's* bow had suffered at the hands of the son of *Das'aratha*.) After this event, *Bharata*, and his brother *S'atrughna*, were sent by their father on a visit to *Bharata's* maternal uncle, *As'vapati*; and *Das'aratha*, who was old, and desired to retire from the world, made all preparations for installing his eldest son, *Rāma*, as heir-apparent to the throne of

Ayodhyā. But in this design he was frustrated; for, through the intrigues of *Mantharā*, the hunchbacked nurse of Bharata, and his queen *Kaikēyī*, he was, in a weak moment, prevailed upon to grant any wish which the latter would ask of him; and *Kaikēyī*, availing himself of *Das'aratha's* rashly-given promise, demanded of him the installation of her own son, Bharata, as heir-apparent, and the banishment to the forest of Rāmā for a period of fourteen years. A promise once uttered being irrevocable, and Rāmā having resolved not to cause a word given by his father to remain vain, neither the wishes of the people of Ayodhyā nor those of Bharata and S'atrughna, who meanwhile had returned, and were enraged at what had occurred, could shake his determination to submit to his exile. *Das'aratha* died in consequence heart-broken, and Bharata assumed, till the return of Rāmā, the government of Ayodhyā.

The long exile of Rāmā which now followed, and was shared in by his brother Lakshman'a, became, then, the source of the wonderful events which should hereafter lead to the destruction of the demon Rāvan'a. They began with a series of conflicts which he had to sustain with the *Rākshasas*, who infested his forest abode, and which invariably, of course, ended in the destruction of these beings. One of these conflicts, however, was especially pregnant with the destiny he had come to fulfil. Rāvan'a's sister, *S'ūrpan'akhā* (lit., a female whose finger-nails were like winnowing baskets), was one of those demons who haunted the woods. She fell in love with Rāmā, but was repelled by him; and when, in a fit of jealousy, she attacked Sītā, Lakshman'a cut off her ears and nose. Enraged at this treatment, she repaid to her brother Rāvan'a, and in order better to stimulate his revenge, she also excited in him a passion for Sītā. Rāvan'a therefore started off for the forest *Dandakā*, where Rāmā lived; and, aided by another demon, *Maichā*, who transformed himself into a golden-colored deer, and thus enticed both brothers away from the hermitage, to chase after it, succeeded in carrying off Sītā to his capital. By means of some other supernatural events then happening, Rāmā discovered the fate of his wife; and the remainder of his exile is now filled up with his preparing for war with Rāvan'a, conquering, and destroying him, and recovering Sītā, whose honour had remained untarnished during her long and severe trials when kept as a prisoner in the harem of Rāvan'a. Some of the incidents of this struggle are of special interest, inasmuch as they are the basis of traditions still prevalent in India. They chiefly relate to the allies of Rāmā, who were no other than miraculous bears and monkeys, and by their magic powers mainly brought about the defeat of Rāvan'a and his armies, while also helping him to communicate with Sītā, during her captivity. All these bears and monkeys were of divine origin, produced at the behest of Brahman by the gods for the express purpose of becoming the allies of Rāmā. Thus, the bear-king, *Jāmbuvāt*, issued from the mouth of Brahman himself; *Bālī* was a son of *Indra*; *Supriya*, of the Sun; *Tara*, of *Vr'haspati*; *Gandhamādana*, of *Kuvera*; *Nala*, of *Vis'vakarman*; *Nila*, of fire; *Susken'a*, of *Varun'a*; *S'arabha*, of *Parjanya*; and the most renowned of all, *Hanumat*, was a son of *Wind*. See the article *HANUMAN*, where several of his feats are mentioned. They overbridged the sea, to carry their armies to Ceylon—whence the line of rocks in the channel is still called *Rāmasetu*, or Rāmā's Bridge—in the English maps, *Adam's Bridge*; they brought large rocks from the *Himālaya* to support the bridge—whence the numerous rocks scattered all over India are supposed to have arisen as they dropped down on their transport to the sea; and they performed similar other feats, still commemorated in festivals performed in honor of *Hanumat* and his tribe. As is the case in other *Avatāras* of *V.*, there is also in the *Rāmā-Avatāra* a personage who, though nearly related to the fiend doomed to destruction, acknowledges the divine nature of the incarnate god, and dissuades his friends from opposing him. In this *Avatāra*, such a personage is *Vibhishan'a*, the uncle of Rāvan'a, whose counsel, however, is disregarded. Similarly disposed is also *Kumbhakarn'a*, the brother of Rāvan'a, who likewise understands that Rāmā is *V.*; but, as he yields to the orders of his brother, his fate is death. *Vibhishan'a*, however, in reward of his proper conduct, is, after Rāvan'a's death, placed on the throne of Ceylon. When, at the end of this fierce war, the time fixed for Rāmā's exile had expired, he returned to Ayodhyā with Sītā, whose purity had previously been tested by an ordeal of fire, and there received back from Bharata the sovereign power which, in the meantime, the latter had exercised in his stead; and at the end of a long and glorious reign, he

became reunited with the splendor of Viṣṇu. The story of this incarnation is briefly told in an episode of the Mahābhārata (q. v.), and in several Purāṇas; with the fullest detail, however, in the "Rāmāyaṇa" (q. v.). A copious abstract of the latter is given in the poem "Bhaṭṭikāvya." See SANSKRIT LITERATURE. The English reader may consult, for some further detail, an "Analysis of the Rāmāyaṇa," in Professor Monier Williams's "Indian Epic Poetry" (Lond. 1863).

8. The *Kṛiṣṇa-Avatāra* and *Balarāma-Avatāra*.—The former of these two, which are generally treated as one, is the most interesting incarnation of V., both on account of the opportunity which it affords to trace, in Hindu antiquity, the gradual transformation of mortal heroes into representatives of a god; and on account of the numerous legends connected with it, as well as the influence which it exercised on the Vaiṣṇava cult (see VAISHNAVAS). In the Mahābhārata (as Dr Muir has shewn in the fourth volume of his excellent work, "Original Sanscrit Texts") Kṛiṣṇa—which literally means, "the black or dark one"—is sometimes represented as rendering homage to Śiva (q. v.), and therefore acknowledging his own inferiority to that deity, or as recommending the worship of Umā (q. v.), the consort of Śiva, and as receiving boons from both these deities. In some passages, again, he bears merely the character of a hero endowed with extraordinary powers, and, in some, his divine nature is even disputed or denied by his adversaries, though they are ultimately punished for this unbelief. As the intimate ally of the Pāṇḍu prince Arjuna (see PANDAVAS), he claims, especially in the philosophical episode, the Bhagavadgītā, the rank of the supreme deity; but there are other passages, again, in the Mahābhārata, in which the same claim of Śiva is admitted, and an attempt is made at compromising their rival claims by declaring both deities one and the same. Sometimes, moreover, Kṛiṣṇa is, in this epōs, declared to represent merely a very small portion—"a portion of a portion," as it is called—of the divine essence of Viṣṇu. In the Mahābhārata, therefore, which is silent also regarding many adventures in Kṛiṣṇa's life, fully detailed in the Purāṇas, the worship of V. in this incarnation was by no means so generally admitted or settled as it is in many Purāṇas of the Viṣṇuīśvīta sect; nor was there, at the epic period, that consistency in the conception of a Kṛiṣṇa-Avatāra which is traceable in the later works.—The principal legends relating to Kṛiṣṇa, as he appears in the Harivaṇṣa and the Purāṇas, are the following: A demon king, *Kaṇsa* of Mathurā, of the race of Yadu, and therefore of the lunar line of kings, who, in a former birth, had been the demon *Kālanemi*, had deposed and imprisoned his father, *Ugrasena*, and oppressed with his iniquitous hosts, the Earth; and Earth having laid her complaints before an assembly of the gods on Mount Meru, Brahmā prayed to V. to relieve the world of its distress. When he had ended his prayer, V. plucked off two hairs, one white, and one black, and promised the gods that these two hairs should become impersonated as *Balarāma* and *Kṛiṣṇa*, sons of Devakī, to fulfil their wishes. Now, Devakī, who, in a former life, had been Aditi (see personified), was a wife of Vasudeva, who was of the race of Yadu, and a relative of Kaṇsa; but as Kaṇsa had been warned by a voice in heaven that their eighth child would be an incarnation of V., he placed both husband and wife in confinement, after having obtained, though, from Vasudeva the promise that he would deliver to him every child Devakī would bring forth. Six children of hers were accordingly given up to Kaṇsa, and destroyed; but when Balarāma, the seventh, was about to come into the world, V. appeared to *Yoganidārd*, a form of Umā (q. v.), and directed her to transfer Balarāma before the time of his birth to *Rohiṇī*, another wife of Vasudeva, and spread the report that Devakī had miscarried; enjoining her also to become incarnate as a child of Yaśodā, the wife of an old cowherd Nanda, at the same time that he would become incarnate, as Kṛiṣṇa, in the eighth conception of Devakī; for at the time of their simultaneous birth, he added, Vasudeva, aided by him, would bring the infant Kṛiṣṇa to the bed of Yaśodā, and her to that of Devakī. In this manner, *Balarāma* and *Kṛiṣṇa* were saved, though the infant Durgā, as soon as born, was dashed by Kaṇsa against a stone, and suffered a temporary death. Kaṇsa having become aware that his design had been frustrated, now ordered the destruction of all young children wherever they might be found, but considering it useless to keep Devakī and Vasudeva any longer in prison, liberated them. Vasudeva, apprehensive of the safety of Balarāma, then took him to Nanda, to be brought up to-

gether with Kr'ishn'a; and thus began the earthly career of these two Avatāras of V., in which Balarāma always figures as the friend and ally of his more important brother, Kr'ishn'a. The first miraculous act of the latter consisted in causing the death of a female demon, *Putāṇā*, who suckled, and meant to destroy, him. Then, as a little boy, he overturned a heavy wagon of the cowherds, and pulled down the trunks of two large trees—to the amazement of the cowherds, who did not yet suspect his divine nature, and becoming afraid to remain any longer in Vraja, the place where these events happened, repaired to Vr'indāvan'a. There Balarāma and Kr'ishn'a remained until they had attained seven years of age. At this time, Kr'ishn'a killed a serpent-monster Kāṭya, in the Yamunā river, and then returned to Vraja. The next exploit of the brothers, more particularly however, of Balarāma, consisted in the destruction of two demons, *Dhenuka* and *Pralamba*, who infested the forests; but that which followed, especially established the fame of Kr'ishn'a, and is one still commemorated in their festivals by the worshippers of this god. When sporting in Vraja, he once found all the cowherds busily engaged in preparing for a sacrifice to be offered to Indra (q. v.). Seeing this, he dissuaded them from worshipping this god, and directed them to address their prayers and offerings to the mountain *Govardhana*. Indra, however, offended by these proceedings, sent a heavy storm, which inundated the country, and threatened to destroy the cattle. Thereupon, Kr'ishn'a plucked up the mountain Govardhana from its base, and held it up as a large umbrella over the cowpens, to shelter the herdsmen and their cattle from the storm. For seven days and nights they were thus protected by the elevation of the mountain; and Indra, at last convinced of the irresistible might of Kr'ishn'a, came to Govardhana, and worshipped him, obtaining on this occasion the promise that Kr'ishn'a would befriend the Pāṇḍ'a prince, Arjuna. In his conflict with the Kuras (see MAH BHARATA). The episode in the life of Kr'ishn'a which now ensued, and is filled up with the pleasures and sports he enjoyed amongst the Gopis, or cowherdesses, is that commemorated in the *Rāsa Yātrā*, an annual festival celebrated in various parts of India in the month of Kārtika (October—November), and dwelt upon in many poetical works. Of these cowherdesses, later poets especially mention *Rādhā*; and she is sometimes also represented as the divine or mystical love to which Kr'ishn'a returns at the end of his more worldly amours (see the article JAYADEVA). After some more miraculous deeds, Kr'ishn'a and Balarāma repaired to Mathurā, where Kansa, in the hope of effecting their death, had invited them to assist at a solemn rite of the installation of arms, and to engage in a trial of strength with his chief boxers, *Chāṇūra* and *Muṣhtika*. *Akrūra*, sent by Kansa to convey to them his invitation, had already revealed to them the purpose for which he was despatched; but undaunted by his words, they accomplished their journey, during which they performed several other wonderful deeds, and, arrived at Mathurā, accepted the challenge of Kansa. The contest ended not only in the death of the two boxers, but in that of Kansa also. Kr'ishn'a now released *Ugrasena*, Kansa's father, from the confinement in which he was kept, and restored him to the throne of Mathurā. A number of other miraculous feats now followed in the career of Kr'ishn'a. The principal are his conquering *Jarāsaṇḍha*, the father-in-law of Kansa, who came to revenge the death of the latter, and *Kālayavana*, a king of the Yavana, who also overran Mathurā with his armies; and his founding the city of Dwārakā. At the end of these wars, he made a short stay at Vraja, then returned to Dwārakā, and there married Revatī, by whom he had two sons. But he also carried off violently *Rukmīṇī*, the daughter of a king of Vidarbha, who had been betrothed to *S'tis'upadi* (q. v.), and had to wage a hot contest with the latter and his allies, before he conquered them. His next war was that with *Naraka*, a demon-king of Prāgyotisha, who had robbed Aditi of her earrings, and ultimately was put to death by him. He then repaired to Indra's heaven, to restore to Aditi her earrings; but carrying off a wonderful tree from Indra's garden, got into a conflict with this god; ultimately, however, he was allowed by him to take the tree to Dwārakā. There he married 16,100 maidens, whom he had rescued from Naraka. Other wars followed, in one of which Kr'ishn'a also fought with *Ś'iva*, when siding with his enemy Bāṇ'a, who was a son of Bali. The most important, however, of all these contests is the great war between the Kurus and Pāṇḍ'us, in which Kr'ishn'a was the ally of the latter. According to the "Viṣṇu-Purāṇ'a," Kr'ishn'a's earthly career was brought to its

close by an event which has nothing in it of the miraculous, and is more consistent with the end of a mortal hero than with that of an incarnate god. He was accidentally shot in the sole by a hunter, who thought that he was aiming at a deer. The hunter, it is true, is called *Jard*, which is a word in the feminine gender, and means "old age," or "decay;" but even if a mere allegory, the story of his end "from old age," or an arrow, barely tallies with the character assigned him in the *Purāṇas*, and is therefore sometimes also omitted in the accounts of this *Avatāra*.—For *Balarāma*, see also the legend in the article *YAMUNĀ*.

9. The *Buddha-Avatāra*, or V.'s epiphany as Buddha.—It is originally foreign to the cycle of the *Avatāras* of V., and therefore only briefly alluded to in some *Purāṇas*. Where this is done, the intention must have been to effect a compromise between Brahmanism and Buddhism, by trying to represent the latter religion as not irreconcilably antagonistic to the former. See *Buddhism*.

10. The *Kalki*- or *Kalkin-Avatāra*.—It is yet to come, "when the practices taught by the Vedas and the institutes of the law, shall have ceased, and the close of the Kalki or present age shall be nigh." V. will then be born "in the family of *Vishnu'ayasas* (possessing the glory of Vishnu'), an eminent Brahman of Sambhala village, endowed with the eight superhuman faculties. He will then destroy all the barbarians and thieves, and all whose minds are devoted to iniquity."—"Vishnu'-*Purāṇa*."

V.'s wife is *Śrī*, or *Lakṣmī* (q. v.), and his paradise *Vatant'ha*. When represented he is of a dark hue, with four hands, in which he holds a conch-shell, blown in battle, the *Pāñchajanya*; a disc, the *Sudarśana*, an emblem of sovereign power; a mace, the *Kaumodaki*, as a symbol of punishment; and either a lotus, as a type of creative power, or a sword, the *Nandaka*. On his breast shines the jewel *Kaustubha*. He is variously represented: sometimes as *Nārāyaṇa** (see the first *Avatāra*), when floating on the primeval waters, and resting on *Śeṣha*, his serpent of infinity—the god Brahman coming out of a lotus that arises from his navel and Lakṣmī being seated at his feet; or riding on *Garud'a*, a being half bird and half man; or seated on a throne, and holding Lakṣmī on his lap; or, if he is represented in one of his incarnate forms, as fish, boar, man-lion, &c., he has a human shape, ending in a fish or a human body with a boar's head, or with a lion's head; or he appears as a dwarf, or (as *Paras'urāma*) armed with an axe; or (as *Balarāma*) holding a plough-share. As *Kṛīṣṇa* he is generally represented either in a juvenile form, or as an adult, in a dancing posture, and playing on the flute. As *Kalki*, he has a sword in his hand, and is kneeling before a winged horse. The leading personages or events connected with these *Avatāras* are likewise frequently associated with the representation of the god: thus, in the representation of the fourth *Avatāra*, *Hiraṇ'yakas'ipu*, as being torn open by the man-lion; or, in that of the sixth, the demon *Arjuna*, fighting with *Paras'urāma*; or, in that of the seventh, the ten-headed *Rāvaṇa*, battling with *Rāmachandra*; or *Hanumat* and the monkey chiefs, paying adoration to the latter; while his brothers stand at his sides, and *Sītā* is sitting on his lap; or, in the eighth *Avatāra*, the mountain *Govardhana*, when uplifted by *Kṛīṣṇa*, and the *Gopīs* sporting with him. V. is praised under a thousand names, which are enumerated in the "*Mahābhārata*," and have been commented upon by *Saṅkara* and other authors.—For other myths relating to V., the general reader may consult H. H. Wilson's translation of the "*Vishnu'-Purāṇa*," in the course of re-editing by Fitzedward Hall (vols. I. II. already published, Lond. 1864—1865); the first nine books of "*le Bhāgavata-Purāṇa*," traduit et publié par Eugène Burnouf, vols. I.—III. (Paris, 1840—1847); "*Harivansa*," traduit par A. Langlois, vols. I., II. (Paris, 1884—1885); Lassen's "*Indische Alterthumskunde*," vol. I. (2d edition, Leipzig, 1866), vols. II.—IV. (Bonn and Leipzig 1852—1861); and the first and fourth volumes of John Muir's "*Original Sanscrit Texts*" (Lond. 1858—1863); see also the representations of V. in Edward Moor's "*Hindu Pantheon*" (Lond. 1810).

VISHNU'-PURAN'A. See *PURANA*.

* "The waters are called *nāra*, because they were the production of *nara* (or the supreme spirit); and since they were his first *ayana* (or place of rest, when in the form of the god Brahman), he thence is named *Nārāyaṇa* (or resting on the waters)."—"*Manu*," i. 10.

VISIBLE SPEECH, a system of alphabetic characters, each of which represents the configuration of the mouth which produces the sound. The system is the invention of Mr Melville Bell—the well-known elocutionist, formerly Professor of Elocution in University College, London—and was published in 1867, under the title of "Visible Speech" (Trübner). Mr Bell has since published a short shilling work—"English Visible Speech for the Million" (Trübner), which is quite enough to give a general idea of the system.

Mr Bell, believing his system to be practically, as well as theoretically, perfect, was anxious to bring it into general use at once, and accordingly made a very generous offer to relinquish all his rights, if the expense of casting the new types, and publishing the theory of Visible Speech, were defrayed by the government. The proposal was rejected, and Mr Bell was compelled to publish his system as an ordinary copyright.

Now that the system has been thoroughly tested by the very few who are competent to do so, we are able to give a definite and impartial opinion on its merits, and to say that the absolute perfection that Mr Bell attributed to it does not exist—that the analysis of sound-formation on which it is based is, in some instances, imperfect or erroneous, and that the symbols might, in many cases, be improved, even where there is no fundamental error of analysis to correct. The chief defects in Mr Bell's analysis of speech-sounds are: (1) his ignorance of the latest results of German investigations of the mechanism of the throat-sounds (whisper, the Arabic gutturals, &c.); (2) his imperfect knowledge of the *synthesis* of sounds, syllabification, word-division, &c.; (3) errors of detail, especially in the consonants, such as his including *f* under the same category as *t* ("divided" consonants), and his analysis of *th*. Other points are still doubtful, and it is certain that, as our knowledge advances, many other difficulties will appear. But it is none the less true that our very knowledge of these defects is due to the vantage-ground on which Visible Speech has itself placed us. It was an immense advance upon any phonological analysis previously attempted, and opened up once for all the way to arrive at definite results. It was, in short, a *new instrument* placed in the hand of the student of phonetics, and it must, it is clear, for many years to come, continue to be a purely scientific instrument. When finally perfected, there can be no doubt that it will come into general use, and finally supersede the present system.

Apart from the question of absolute perfection, we cannot refuse Mr Bell's analysis our profound admiration as a great work of genius. Unaided by the resources of the German physiologists, he has completely beaten them on their own ground: where they, with all the resources of the laboratory at their command, have painfully collected a few isolated observations, he has erected a splendid edifice. And it is precisely where they utterly break down—namely, in the analysis of the vowels—that his genius shines most brightly. By his discoveries of the distinction of "narrow" and "primary," of the "mixed" vowels, intermediate between the guttural and palatal ones, and of the compound character of the labial vowels, Mr Bell has been able to select from the enormous number of shades of vowel-sound (for every movement of the tongue produces a new sound), certain definite formations, thirty-six in number, all definitely correlated, which include, with the various intermediate formations, all possible simple vowel-sounds.

The system of notation is not less a work of genius than the physiological analysis on which it is based. All the letters are formed by the combination of about thirty radical symbols, most of which are to a certain extent pictorial of the action of the organs which produce the sound. Thus a simple circle *o* represents breath issuing from the open throat (aspiration); while the *narrowing* of the glottis which produces vocal murmur is symbolised by *I*, from which, by modifiers to indicate guttural, palatal, "primary," "wide," &c., all the vowel-symbols are formed. Contraction in the mouth is indicated by a *C*, and the *part* of the mouth in which the contraction takes place is shown by the direction in which the symbol is turned—thus, *o* denotes contraction in the *back* of the mouth (Scotch and German *ch* in *loch*), *o* denotes lip-contraction. Complete stoppage is indicated by drawing a line across the opening, giving a symbol resembling *D*, which turned this way would represent the sound of *p*, while *Q* would represent *k*. The symbols for vocality, nasality, &c., are similarly incorporated into the consonant symbols. This will be enough to shew the two chief features of the system: (1) its simplicity and

perfect consistency ; and (2) the correlation of the symbols. Thus, when the student has learned to recognise the symbol for *m* as differing from *b* only in the addition of the sign for emission through the nose, he is at once able to recognise and form for himself the symbols of *ng* and *n*, if he is already acquainted with those of *g* and *d*. Such a system is evidently of the highest value in all philological investigations which involve the study of sound-changes in different languages. It has been found that many phenomena of language, such as "umlaut," which, when formulated in the ordinary Roman type, require a long technical exposition to be made intelligible, explain themselves at once without further comment when transcribed into the visible speech symbols. It is from the use of visible speech by scientific philologists that we hope most, both for the progress of phonetics and general philology, and also for the improvement and ultimate practical application of visible speech itself. A striking example is afforded by Dr J. A. H. Murray's admirable work on the "Southern Dialects of Scotland," in which the phonetic portion owes its clearness and exactness mainly to the use of visible speech. It has also been employed by Mr H. Sweet in his "History of English Sounds." Mr A. J. Ellis, lastly, the father of scientific phonology in England, although employing a system of his own, refers constantly to visible speech, to establish the absolute value of his symbols.

The practical applications of the system to the acquirement of the pronunciation of foreign languages, to telegraphy, to the instruction of the deaf and dumb (for which it is already largely employed in America), and to general elocutionary purposes, are self-evident. It is clear that visible speech has a brilliant future before it, and it is the duty of all interested in the advancement of science and education to do all they can to disseminate a knowledge of it among all classes.

VISION. See GOTH.

VISION, the act of seeing ; that faculty of the mind by means of which, through its appropriate material organ, the Eye (q. v.), we are percipient of the visible appearances of the external world. Considered in the latter signification, vision includes questions of high importance in relation to some of the most intricate problems of philosophy ; but as this part of the subject has already been discussed under PERCEPTION, the present article will be restricted, as far as possible, to an exposition of the phenomena and laws of vision proper. In opposition to the bulk of mankind, who believe undoubtedly that they actually see the externality and solidity of the bodies around them, Bishop Berkeley maintained that these properties are not the immediate objects of sight at all, but are simply ideas derived originally from the touch, and erroneously attributed to vision, in consequence of their having been uniformly experienced concurrently with certain "visible signs" (as, for example, color), with which alone the sense of sight is truly conversant ; and this theory of vision having since received the adhesion of a great majority of the most able metaphysicians, it will be proper to give an outline of its leading propositions. In doing this, we shall at the same time intersperse such remarks and counterstatements as may appear to be rendered necessary by the progress of opinion and the results of modern experimental inquiry. As to the externality, or oneness, of objects ; or, which is the same thing, their distance from the eye. This, Berkeley maintains, cannot of itself and immediately be seen. "For distance being a line directed end-wise to the eye, it projects only one point in the fund of the eye ; which point remains invariably the same, whether the distance be longer or shorter." To this position, everywhere assumed by Berkeley to be indisputable, and by his followers admitted to be so, it may be objected, that it contains an unwarranted assumption, viz., that a ray of light is, by its very nature, incompetent to convey an impression indicative of its possessing length or extension ; or, to speak more accurately, it assumes that "apparent distance" is not at all affected by a variation in the actual length of the ray intervening between the eye and the object. Yet it seems obvious, that the facts of vision do not admit of our arguing the matter, as though the line extending from any point of an object to the eye were a mere mathematical abstraction. Every visible point sends forth diverging rays, which form a cone whose base is on the pupil of the eye ; and to the eye, the place of this visible point is at the intersection, real or virtual, of the rays in question : real, when the radiant point is viewed directly ; virtual, when the rays, either by refraction or reflection, are diverted from their original path before reaching the eye. To take a

case of refraction: if we notice the distance of a shilling lying at the bottom of an empty vessel, we shall observe, upon filling the latter with water, a manifest diminution in the apparent distance of the shilling, the reason being that the rays, on their emergence from the water, are bent outwards, so that the point of their virtual intersection is brought nearer to the eye. In reflection, the place of a visible point is, in like manner, referred to the point of virtual intersection of the cone of rays incident upon the pupil; and by multiplied reflections, the apparent distance of a point actually adjacent to the eye, may be increased to an almost indefinite degree. It is forcibly contended by Berkeley that these facts, involving, as they do, geometrical considerations known only to few, and by none consciously realised in the act of vision, cannot be concerned in our appreciation of distance by the visive faculty. Yet these, and numberless similar experiments, render it evident that both "apparent distance" and "apparent place" are closely dependent upon these geometrical conditions; and, therefore, without assuming that vision is performed by the aid of connate or instinctive geometry (a notion justly condemned by Berkeley), it yet seems highly probable that these lines and angles are the exponents and invariable concomitants of an actual operation of light upon the eye, specific in its character, and by reason of its necessarily varying *part passé*, with every change in the distance of the point of intersection of the visual rays, fitted to convey to us an intuitive perception of varying distance.

In the article *Eye* (q. v.), it has been shewn (as, indeed, necessarily follows from optical principles) that the eye does actually undergo specific modifications, depending for their amount on the distance of the object; and there therefore seems an intrinsic probability that these distasteful variations in the organ of sight are correlated to those facts of our consciousness which we denominate variations of visible (not tangible) distances; and as, furthermore, it may be demonstrated by optical experiments that the "apparent distance" of a visible point is directly modified, to our perception, by a simple change in the mutual inclination of its diverging rays, it seems an ineluctable conclusion, that that agency of light which suggests to our minds differences of distance is competent to suggest distance itself.

Berkeley was quite aware of the necessary connection which subsists between the distance of an object and the divergency of the rays it emits, though it may be doubted whether he adequately weighed the importance of the train of consequences evoked within the eye itself by this variable divergency of incidence; but he affirms that the mind is not by these means helped to a conception of distance except in so far as by experience we have found that increased divergency, carried to the extent of producing "confused vision," is constantly associated with diminished distance. And in proof that this association is merely accidental, Berkeley cites a curious optical experiment, which shews that where the incident rays are caused slightly to converge, instead of their suggesting, as one would be led to expect, that the object is at an enormous distance, the result is altogether different; viz., at first, when the eye is close to the lens, and vision distinct, the object is seen at its true distance, but afterwards, as the eye is gradually withdrawn, and vision becomes continually more "confused," the object appears to be enlarged in all its dimensions, and to approach nearer and nearer, until it vanishes in mere confusion from the view. "This phenomenon," he says, "entirely subverts the opinion of those who will have us judge of distance by lines and angles, on which supposition it is altogether inexplicable." To which it may be replied, that the hypothesis being that the mind judges (mediately) by "the various divergency of rays," it cannot fairly be tested by experimenting with rays that are convergent, and that necessarily produce conditions of vision the reverse of those normally prevalent. But, besides, it is now certain that the explanation given by Berkeley is not the true one; for it has been shewn, by Professor Wheatstone, that when the dimensions of a retinal picture are continuously increased (as is the case in the above experiment), the object appears to approach in the most evident manner.

From the doctrine of Berkeley, that the sight is not immediately perceptive of distance, it necessarily follows that the parts of a solid object will not be seen as some of them more remote than others, but as if situated all in one and the same plane. This opinion has accordingly been maintained by more recent writers; yet its unsoundness seems manifest; for, if objects be originally seen, not as solid objects, but as perspective representations on a plane, then this plane must be seen

either at no distance (which is absurd), or at the same distance for all objects (for which no reason and no evidence can be assigned); or at distances varying with the distances of the objects; but as the last two and only tenable suppositions assume the visual perception of distance, which is the very principle sought to be invalidated, the theory is thus shewn to be futile and self-contradictory. If it be admitted that, by the constitution of the organ of sight in relation to light, we are perceptive of distance at all, it is in the highest degree probable, judging not only from analogy, but from the proved distasteful affections of the eye, that we perceive by the sight degrees of distance; and a perception of the latter implies, it has been shewn, a perception of trinal dimensions. Now, although it is strenuously maintained by the adherents of Berkeley that this is not a primitive attribute of vision, it is not denied by any, that in the exercise of our mature sight, we do undoubtedly perceive the oneness, the distance, and the trinal extension of visible objects; but, say they, these very qualities, not being modifications of light or colors, are only in appearance directly perceived by the eye; they are, in fact, the product of tactual experience, but by long and invariable association with the phenomena proper to sight, are now instantaneously suggested by them, in a manner so intimate that the two sets of perceptions have become, to our consciousness, indissolubly one. This, in effect, is to affirm that we cannot see an object to be possessed of trinal dimensions, until its occupancy of space is assured to us by the touch; whereas, we venture to maintain, that we see objects to occupy space, and that what we owe to experience is a knowledge that the major part of these visible appearances have, underlying them, that which, on our making a proper disposition of our bodies, will produce in us tactual sensations. We advisedly say the major part, because there are many objects in nature, such, for instance, as wreaths of smoke and vapor, which, though to the sight visibly possessed of trinal dimensions, are totally imperceptible to the touch. And opinion has arisen out of the ambiguous meaning of the word "solidity," by which those who agree with Berkeley always signify, not mere occupancy of space, which, as we have shewn, may be associated with a total absence of tangible qualities, but "resistant extension" in three dimensions, which, beyond all doubt, is solely cognisable by the touch. It is, of course, in the former sense alone that we vindicate to the sight an immediate perception of "solidity;" and we do not use the term "occupancy of space" at all in the sense of mechanical exclusion, an idea manifestly derived from touch, but only as affirming the immediately perceived trinal extension of visible objects. It may also be here remarked that there are many substances of extreme hardness, and therefore in the highest degree perceptible to the touch, which, though set in a strong light, remain quite invisible; as, for example, the sheets of plate-glass used by Professor Pepper in producing his "ghost-illusions." Indeed, strictly speaking, all perfectly transparent substances, and all perfectly reflecting (polished) surfaces, are invisible. Again, there are many appearances in nature, into our perception of which there enters no element of tactual experience, even as it respects variety of surface (color, of course, being excluded from this consideration); as, for example, the waves of the sea, spread out in long undulating lines, or breaking in foam upon the shore; and all those objects which, by their minuteness and the delicate diversification of their shape and outline, elude the cognizance of the touch. These facts are adduced simply to illustrate the complete distinction and independence which subsists between the two sets of sensations, originating, respectively, with the sight and the touch—a point strongly enforced by Berkeley himself, who did not hesitate to affirm, not only that our habit of referring the two sets of sensations to the same objects is the mere effect of our having experienced them together, but that the two sets of ideas thus "intromitted into the mind" belong, in fact, to two classes of objects, numerically distinct—the one outward, distant, and tangible; the other visible, but at no distance, and therefore, in reality, contained within the mind itself. But, as has been well pointed out by Mr Bailey, this very distinction, taken in conjunction with the undoubted fact, that we do in maturity apprehend by the sight the distance of visible objects, furnished a strong presumption that those perceptions cannot have belonged originally to the touch. How little tactual sensations are able to modify visual perceptions is exemplified (as Mr Bailey remarks) by the fact, that "a straight stick, with one end placed in a basin of water, would still appear to the sight to be bent at that end, after a thousand proofs by the touch that

It was otherwise." In the same way, the finger immersed in water appears "unnaturally bent, though the experimenter feels it to be otherwise."

The nature of "visible" or "apparent distance," and how it compares with "real distance" we shall consider when we come to speak of apparent, as contrasted with real magnitude. But we will first inquire what are the optical conditions within the eye itself which determine our perception of the direction of a visible point. Every such point, as we have before remarked, radiates to the eye a cone of diverging rays, whose base is situated in the pupil of the eye; and these rays being refracted in their passage through the eye, are brought to a focus on the retina, thus forming another cone, the base of which is opposed to that of the incident cone, whilst its apex coincides with the focal point of the refracted rays. If the point of emission be placed directly before the eye, it will be seen in the direction of the common axis of these two cones; or, in other words, in the optic axis; and the point in which this axis bisects the common basis of the two cones is called the optical centre of the eye. Let us suppose, now, another visible point, a little above the first, but at an equal distance from the eye; this, too, will send forth to the eye diverging rays, which will, in like manner, be refracted to a focus upon the retina at a point a little below the preceding; and the line of visible direction will pass from the point of convergence on the retina through the optical centre. Now, it is evident that the rays, by means of which we see a visible point, come to the retina from all possible directions within the limits of the cones they collectively form. How comes it, then, that we perceive the object only in one determinate direction? The explanation usually given (founded on experiments in which a portion of the cone has been excluded without apparent change in the visible direction) is, that, by the constitution of the sense, upon any point in the retina receiving the apex of a cone of rays, we perceive the object in a right line extending from that point of the retina through the optical centre; or, according to others, in a right line perpendicular to the surface of the retina at that point. It will, however, be more consistent with the principle that the incidence of light is accompanied by a positive action, related to its direction as well as to its other properties, if we express the law of visible direction by saying, that upon a multitude of rays from all possible directions falling upon a retinal point, the perceived direction is the mean or resultant of them all; which is just as true an account of the phenomena, and amounts, we think, to something more than a verbal distinction. The optical facts we have thus, in brief, indicated, if followed out with respect to all the visible points forming the object of sight, render it evident that inverted images of the latter are painted upon the retina; and the inquiry is prompted, how these can give rise to erect vision. On reflection, it will be seen that an explanation of this old and much debated "paradox of vision," is involved in the preceding statement of the law of visible direction, in whichever way it may be expressed; and, as has been shewn by previous writers, the difficulty itself has arisen solely from the assumption, contrary to fact, that we see the retinal pictures, whereas, considered as images, they are not even the means, but only concomitants of that operation of light by which we see. Even this important distinction, however, does not convey the whole truth; and we trust it will not be deemed an unnecessary refinement, if we point out that in a strict sense there is no *image* upon the retina, but only a concourse of rays, which, *to the eye of another person*, will undoubtedly give the perception of an image, but cannot be affirmed to exist, as an image, except in relation to this second observer. It is therefore with this reservation that the term retinal images is here made use of. As a consequence of all the lines of visible direction passing through the centre of the eye, it follows that as an object recedes from or approaches the eye, its retinal image becomes proportionately less, or greater; and, in like manner, the visible object itself varies in magnitude, under certain limitations, to be presently referred to, with every change in its distance. But as "the magnitude of the object which exists without the mind, continues always invariably the same," it is evident, argues Berkeley, that "whenever we speak of the magnitude of anything, we must mean the tangible magnitude," which alone is measurable by "settled stated lengths." The sense in which this is true, clearly illustrates the nature of magnitude and distance, as apprehended by the sight, in contradistinction to what is called real magnitude and real distance, the product of tactual experience. It must not be understood as imputing to the touch

a superiority in mensurative capacity, but as simply meaning, that by the touch we come to know that the external world is endowed with resistant qualities—such as hardness, impenetrability, and incompressibility—qualities which we cannot conceive as modifiable by our bare visual perception of them; and from this experience accrues our conception of the reality and actuality of the magnitude and distance of objects, accompanied by a belief that the variability of magnitude and distance perceived by the sight is an appearance only, and dependent on conditions solely of a subjective kind. If this be a correct view, we are not forced to deny with Berkeley that the objects of sight are numerically the same as those we are cognizant of by the touch.

But we must now pass on to the concluding part of the subject—viz., “single vision with two eyes;” in treating of which we shall have recourse, almost exclusively, to the masterly researches of Professor Wheatstone, of whose admirable discoveries in this department of knowledge we have already had occasion to speak in the article STEREOSCOPE (q. v.). It will be obvious to those who have read what is there stated, that the question of single vision with two eyes is naturally divisible into two classes—the first including those cases in which the optic axes are parallel, and the retinal images exactly alike;—and the second, those in which the optic axes are convergent, and the retinal images dissimilar. Now, to see an object double is to see it in two different places at the same time; and therefore, if it can be shewn that by the law of visible direction an impression upon corresponding points of the two retinas is necessarily referred to the same place, this will account for our single vision of the object at that spot. And on consideration, it will be plain that this is really what happens when the optic axes are parallel, and the images identical. But it is also evident that this explanation does not apply to the second class of instances; in which the only visible point which depicts itself on corresponding portions of the two retinas, is that point to which the optic axes are directed. All other points, whether situated before, beyond, or in the plane of the horopter,* are projected upon non-corresponding points of the retina; and as these conditions were presumed to be inconsistent with single vision, it was asserted by Aquilonius that objects are seen single only in the plane of the horopter (it has since, with greater consistency, been said, only at the point of intersection of the optic axes); but that

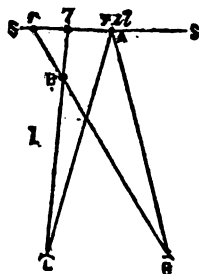


Fig. 1.

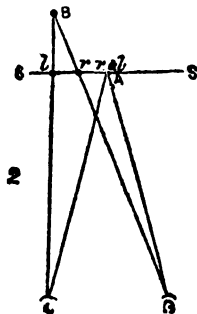


Fig. 2.

* The horopter is a right line drawn through the point of intersection of the optic axes parallel with a line joining the centres of the eyes; a plane drawn through this right line at right angles to the plane of the optic axes, is called the plane of the horopter.

this is not true is evinced by our common experience that, without movement of the optic axes, we enjoy a certain limited field of distinct vision. Its complete refutation, however, is involved in the theory of stereoscopic vision, which may be thus explained: Let the optic axis of the right eye (R) and of the left eye (L) be converged on the point A; suppose another point B, slightly to the left, and in advance of A; and then through the point B draw lines from L and R respectively intersecting the plane of the horopter in r and l (Fig. 1). Now, if two diagrams, SS, be prepared (the one representing l and A, and the other r and A), and these be presented to their appropriate eyes in the stereoscope, with the view of each eye limited to its own picture; the points r and l will be seen as a single point, situated not on the paper, but in advance of it, in the point of intersection of the lines of visible direction, indicated in the above construction by lR and Ll . If the point B be supposed beyond A, and also to the left of it, the lines drawn from L and R to B will intersect the plane of the horopter in l and r (fig. 2); and stereoscopic pictures SS prepared under these converse conditions will exhibit the points l and r as a single point placed behind A at the point of intersection of the lines drawn from L and R respectively. This simple rule involves, as it seems to us, the true principle of the stereoscope; and it is capable of being applied to the most complicated stereoscopic pictures. For, in a stereogram, let l and r stand for identical parts of the left and right pictures respectively, and suppose the pictures superposed; those parts which, read off laterally from left to right, stand in the order lr will recede, and those in the order rl will protrude (relative to those parts of pictures in which r and l absolutely overlap each other), when pictures are viewed together in the stereoscope. It appears, then, that vision of the third dimension of space is directly obtained by impressions on non-corresponding retinal points; the proof of this being given in the appearance of solidly experienced in the stereoscope, although perfectly plane representations are alone employed; but it would be an error to suppose that this non-correspondence is without a limit; and the question still remains, to what extent the retinal points affected may be non-correspondent, consistently with single binocular vision. Without attempting to propose any definite solution of this difficult question, it may, we think, be considered as highly probable that this limit is determined by the same law which regulates our distinct vision of objects by means of rays in exactly focussed on the retina; for, according to Mr Abbott, "as long as the rays are contained within the area of one sensitive minimum, the sensation will be that corresponding to the vision of a point;" and "a certain amount of dispersion does not interfere with distinct vision." It seems certain that the double perception which is experienced of the farther of two objects, when the optic axes are fixed on the nearer, or *vice versa*, can only arise when the object, thus doubled, is situated within the angle of the optic axes (whether before or beyond their intersection); for under these circumstances only, the sensitive points affected are not simply non-correspondent, but are utterly diverse, being in fact on different sides of the centres of the retina in the two eyes. That the law of projection of the various points composing the relief of a stereoscopic object is correctly stated above, is strongly corroborated by a curious experiment of Mr Wheatstone's, in which, solid objects are placed in the stereoscope, instead of pictures. As, for example, two skeleton cubes, so placed, that when the optic axes converge upon them, identical pictures are depicted on the retina; in which case, all appearance of relief vanishes, and a perfectly plane perspective representation of a single cube is alone visible; the reason being, that the lines of visible direction for each point intersect each other, neither before nor beyond, but in the plane of the horopter, where, accordingly, the object is seen as a perspective projection. The same rule holds when the right and left eye pictures are interchanged, for the pictures being suppoed, as before, to overlap one another, the parts lr become now rl ; that is, instead of having their point of intersection beyond the plane of the horopter, they have it before that plane; and this, *mutatis mutandis*, being true of all the parts of the pictures, the stereoscopic resultant is the converse of that which would be perceived but for this abnormal arrangement. In these phenomena, named by Mr Wheatstone the "conversion of relief," and copiously treated of by him in his various papers, the usual relations of distance also are reversed, the nearer parts being seen as farther, while the latter are perceived to be of larger dimensions than the former; and, the same principle being applied to the vision of solid objects by means of an instrument called the Pseudoscope (q. v.), also invented by Mr Wheatstone, they are seen as if turned inside out, and under divers other

aspects of a most extraordinary character, some account of which will be found in the article just cited. But, as to many of them, it proper to mention, that the facility of conversion is found to depend, not on the optical conditions, which, of course, remain invariable, but upon mental conditions, as, for instance, previous familiarity or otherwise with the converse forms suggested; in short, upon our previous *visual* experience.

We have not yet considered those cases in which the retinal pictures are identical, and the optic axes convergent. In these, the law is, that the object is seen in the plane of the horopter, as is conclusively proved by a beautiful experiment, suggested by Sir D. Brewster. If, while looking at a wall-paper, consisting of a small pattern, continually repeated at intervals not exceeding $\frac{2}{3}$ inches from centre to centre, we cause the eyes to converge to a point in front of the wall, the paper will appear to advance to that point, and will there be plainly visible, in spite of the contradiction of the touch, which, of course, cannot feel the wall where it is seen; while, on the other hand, the eye can perceive no wall in the place where the touch affirms it to exist. The converse of this experiment, although more difficult to perform, is equally curious and instructive. It has also been shown by Mr Wheatstone, that if an increasing convergence of the eyes be unaccompanied by its usual concomitant, a corresponding enlargement of the retinal pictures, the object is seen as if continuously diminished in all its proportions, albeit the size of the retinal images remains unaltered. This experiment, which, with several others of almost equal interest and importance, may be performed by means of the stereoscope, also establishes that every degree of convergence of the optic axes is associated with the particular adaptation of the eye suited for distinct vision at that distance. This adaptation is, of course, directly dependent upon the divergency, less or greater, of the impinging rays, and this again stands in a necessary relation to the distance, real or virtual, of the point from which they diverge; a branch of the subject to which we have already given sufficient prominence. All observations and experiments concur in shewing that a part of the highest importance is played in vision, by the convergence of the optic axes, in particular, in so far as this is conjoined with a difference between the two retinal pictures; and, for this reason, it matters but little that we cannot, within our present limits, enter on a discussion of the evidence obtained from those persons, blind from birth, who have gained their sight by means of a surgical operation; for, in almost every case, only one eye at a time was operated upon, and the information then obtained from the patients, under circumstances of so much difficulty, is admitted on all hands to be of a very dubious and unsatisfactory character.

By mere modification of the light incident upon the eye, the same visible objects may be seen under infinite variations of figure, situation, and magnitude; while, at the same time, their real figure, real situation, and real magnitude, as apprehended by the touch, shall remain unaltered; but these phenomena, artificially induced, argue nothing against the general fact, that under normal circumstances we find, in the very place of the visible objects, those "dynamical qualities" which form the sum-total of our factual experiences. To Berkeley is due the credit of having first pointed out the original entire disconnection and subsequent intimate blending of the two sets of experience—visive and tactual; but, if the views here proposed be correct, he erred in supposing that our realisation of the geometrical proportions and relations of visible objects, is dependent on the suggestions of touch, and not upon the exercise of a primitive and inherent function of sight. To the popular view, the objects of sight have a positive and equal existence in absolute darkness, and are simply rendered visible by the light; whereas they are, in truth, the light itself variously modified. But, in conclusion, while fully admitting that light and its modifications, viz., color in all its varieties, form the sole objects of sight, we venture to maintain that we only know color by our perception of it, as making up, by its superficial distribution, the visible form and shape of the objects of the outer world; and that this our perception of the shape, relative magnitude, and situation of visible objects is immediate, and strictly regulated by the laws of light in relation to the visual organ, irrespective of, and even in opposition to, tactual experience; but, at the same time, we hold that to the touch alone, we owe our belief, that these visible appearances are the signs of a materiality underlying them, in its nature unaltered and unalterable by our bare visual perception of them under aspects continually varying; and therefore, in all questions which relate to real size or real dis-

tance, we necessarily have recourse in thought to those qualities of matter which are apprehensible by the touch.

That an instinctive power of direct visual perception is possessed by the young of the lower species, is not denied by any; whether a like power has been bestowed upon man, we must now leave to the consideration of the philosophic reader.

See Berkeley's "Theory of Vision;" also his Vindication of that theory, a rare tract, republished, with valuable notes, by H. V. H. Cowell (1860); Wheatstone "On the Physiology of Vision," Part I., in "Phil. Trans." (1838); Part II., *idem* (1862); Review of Berkeley's "Theory of Vision," by Samuel Bailey; review of the last-named work by J. S. Mill, in his Dissertations and Discussions; "Sight and Touch," by T. K. Abbott; &c.

VISITATIONS, *Heralds'*, periodical circuits which were in use to be performed by the provincial kings-of-arms in England, in order to take cognizance of the arms, pedigrees, and marriages of the nobility and gentry. A visitation is said to have been held as early as the reign of Henry IV.; but the earliest visitation, in pursuance of a royal commission, was made by Thomas Benolt, Clarencieux, in 1528—1529, and comprehended the counties of Worcester, Berks, Oxford, Wilts, Gloucester, and Stafford. From that time, the visitations were repeated at periods varying from 25 to 30 years; never, however, extending to Wales, except on one occasion, in 1591. The latest commission was dated May 19, 1686, and under it some pedigrees were recorded as late as 1708—1704. The cessation of the visitations seems to have arisen from the frequent prohibitions granted by the Court of King's Bench to stay proceedings in the Earl Marshal's Court, and the abolition of the Constable as a permanent officer, in consequence of which the officers-of-arms found it difficult to enforce attendance. The records of the visitations, though not absolutely free from error, contain a mass of historical and genealogical information of great value. They form the principal source of evidence regarding the hereditary right to bear arms in England. The register-books have been scattered among various public and private libraries, including the British Museum (which possesses 813 visitation-books), the College-of-Arms in London, and the Bodleian Library. Some of them are no longer extant. A number of the visitations have lately been printed, and others are in the press. A catalogue of the visitations preserved in the British Museum was printed by Sir N. H. Nicolas in 1825; an index to the pedigrees and arms in about 250 of the principal MSS. there was published by Mr Sims in 1849, and an index to all the printed visitations by Mr George Marshall appeared in 1866.

In Scotland, there was no such regular system of visitations. A statute of James VI. (1592, c. 125) empowered Lyon King-of-Arms to visit the whole arms used within the realm; and visitations were undoubtedly made in pursuance of this act; but they seem to have been very partial, and no record of them is preserved. Something like a general visitation of Scotland again took place after the Restoration, under Act 1672, c. 21, the statute instituting the armorial register in the Lyon Office, which record was constituted the sole legal evidence of a right to bear arms, and has been continued to the present day.

VISITOR, in the Law of England, is one who has a right to inspect the internal government of a corporation of charity. Thus, the ordinary, who is generally the bishop, is the visitor of spiritual corporations. Corporations instituted for private charity and lay foundations are visitable by the founder, or his heirs, or his nominees.

VISOR, or **VIZOR**, otherwise called **BEAUVOIR** or **BEAVER**, the part of the helmet of the middle ages which protected the face. It was perforated to admit light, and movable, so that it could be raised or put down at pleasure. According to the rules established in the later heraldry, the helmet of a knight, when placed over his shield of arms, has the visor up, while that of an esquire has the visor down.

VISTULA (Lat. *Vistula* or *Vistula*, Ger. *Weichsel*, Rus. *Wisla*), an important river of Austria, Poland, and Prussia, rises in Austrian Silesia, near the frontier of Galicia, in a morass in the Jablunka Mountains, 15 miles south-east of Teschen (q. v.), and at the height of 2000 feet above sea-level. Formed by three head-waters the White, the Little, and the Black Vistulas, the V. flows north-west a few miles to the village of Weichsel, where its course is marked by a fall of 180 feet, and thence to the town of Schwarzwasser, where it leaves the mountains. At this point, the V.

turns north-east, and flows in this direction past Cracow, to its confluence with the San, 10 miles below Sandomierz, forming throughout nearly the whole of this part of its course the boundary between Galicia and Poland. From its confluence with the San, the river turns to the north, enters Poland, which it traverses in a general north-west direction, passing Lublin, Warsaw, and Lipno. Leaving Poland, it enters the kingdom of Prussia, flowing west-north-west to its junction with the Bomberger Canal; thence north-north-east, past Kulm and Schwetz, to Graudenz, where it turns north, and flows in that direction to its embouchure in the Baltic Sea, which it enters by several mouths. About 10 miles below Marienwerder, it throws off an arm called the Nogat, which, taking a north-east direction, and after flowing 32 miles, enters the Frisches Haff by about 20 mouths. The main stream continues to flow north for 115 miles, dividing, however, into two branches, one of which flows into the Frisches Haff, the other into the Gulf of Danzig at Weichselmünde, 3 miles below Dausig. The V. receives from the right the Bug, the San, the Dunajec, and the Wleprz; from the left, the Pilza and Brahe. The V. is 690 miles in entire length. It becomes navigable at Cracow for small vessels, and for large vessels at the confluence of the San.

VIS VIVA. See WORK.

VISWAMITRA is one of the most interesting personages in the ancient history of India. According to the *Āltarĕya Brāhmaṇa*'s (see *VEDA*), his father was *Gāthiṇ*; and in a remoter degree, V. derived his pedigree from the king *Purūravas* (q. v.), who was an ancestor of *Kuśika*. In the *Mahābhārata*, *Rāmāyaṇa*, and the *Purāṇas*, his father is called *Gāthi*, and the origin of the latter likewise traced up to *Purūravas*; but the distance between the two latter personages is differently filled up in the genealogies given by some of these works. As, according to several accounts, V.'s sister was *Satyavati*, who married *Richtika*, and bore to him *Jamadagni*, he was the maternal grand-nucle of *Parasurāma* (see *VIṢṆU*, the sixth *Avatāra*). He had 100 sons, 60 of whom were, for an offence they committed, degraded by him to become outcasts, and the progenitors of the *Andhras*, *Puṇḍras*, *Sābāras*, *Pulindas*, *Mātibāras*, and other frontier tribes, which in the *Vedas* are called *Dasyus*, or robbers. V. is the author of many hymns of the *R'igveda* (see *VEDA*), especially of its third, *Manḍala*; but his fame, which pervades all the periods of Sanscrit literature, is chiefly founded on the remarkable fact, that though by birth a *Kṣātrīya*, or a man of the military caste—he is also described as a *Rāja* of *Canon*—he succeeded in having himself admitted into the *Brāhmaṇic* caste, after a long contest, which, for this end, he had to wage with the *R'ishi Vasishṭha* (q. v.). That the result of this contest was the elevation of V. to the rank of a *Brāhmaṇa*'s, is the account given in the epic poems and the *Purāṇas*; but as the rivalry between V. and *Vasishṭha* is already alluded to in several passages of the *R'igveda* hymns, and as at their time the caste distinction of later periods of Hinduism was not yet established, it is probable that the later traditions relating to this contest rested on the circumstance, that *Sudda*, a king named in the *R'igveda*, who, as is there stated, employed *Vasishṭha* for his house priest, allowed, for some unknown reason, also V. to officiate for him at sacrifices, and that the latter, incurring on this ground the jealousy of *Vasishṭha*, had to maintain, probably by force, the prerogative conferred on him by his royal master. In the epic poems and the *Purāṇas*, the rivalry between these two personages is the subject of several legends, which, considering the relative age of the kings referred to in them, would encompass a period far exceeding that of the lifetime of a human being. A kind of consecutive biography of V. is given in the first book of the *Rāmāyaṇa*, of which it forms one of the most interesting episodes. Its substance is as follows: Once, when roaming over the earth with his armies, V. came to the hermitage of *Vasishṭha*, and was there received by the saint in the most sumptuous style. *Vasishṭha* could afford to entertain the king in this manner, because he possessed a fabulous cow of plenty that yielded him everything he desired. V., becoming aware of the source of *Vasishṭha*'s wealth, strongly wished to possess the cow, and asked *Vasishṭha* to sell her to him. The saint, however, refusing this offer, the king seized her, intending to carry her off by force. But the cow resisted, and ultimately displayed her supernatural powers in producing from different parts of her body numerous peoples, and by their aid destroying the armies of *Viswamitra*. The king then had recourse to the magical weapons he possessed, but

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they were defeated by those of Vasishth'ha; and to the humiliation thus inflicted on him he then gave vent in exclaiming: "Contemptible is the might of a Kshatriya; a Brâhman's might alone is might." And reflecting on what he should do in this emergency, he resolved to practise austerities in order to attain the rank of a Brâhman. In consequence, he went to the south, and performed severe penance during a thousand years; when, at the end of this period, the god Brahman appeared, and announced to him that he had become a Râjarshi, or royal Rishi. But V., not satisfied with this degree of holiness, continued his austerities for another such period. During that time, a king, *Tris'anku* of Ayodhyâ (Oudh), of the family of *Iکشوہک*, had conceived the design of performing a sacrifice, that he might bodily ascend to heaven, and solicited for this purpose the assistance of Vasishth'ha, who was the family priest of "all the Ikshwâkus." This saint, however, having declared the scheme of the king impossible, and his sons, too, to whom the king likewise addressed himself, having refused compliance with his wishes, he told them that he would resort to another priest, and was, in consequence, cursed by them to become a man of the lowest caste. In this condition, he went to V.; and the latter shewed his power by performing the sacrifice, so much desired by Tris'anku, and accomplishing his object, in spite of the resistance of Vasishth'ha and his sons, and that of the gods themselves. (The "*Harivans'a*" relates this story with somewhat different detail, but brings it to the same issue. According to the *Vishnu's Purân'a*, which alludes to the version mentioned in the last-named work, Tris'anku was the 28th in descent from Ikshwâku; but in the *Râmâyana's*, there are only five kings between Ikshwâku and Tris'anku.) This event having caused a serious interruption in the austerities of V., he proceeded to the forest *Pushkara*, in the west, to remain undisturbed. But while he resided there, it so happened that *Ambarisha*, another king of Ayodhyâ, intending to perform an expiatory sacrifice, and requiring a human victim for this purpose, after a long search, had bought for immolation from the Brâhman *Richtka*, the brother-in-law of V., his son *S'unah's'epha*, and was bringing him home to his capital. On his journey, he halted in the forest *Pushkara*, and when S'unah's'epha there saw his uncle V., he implored him to come to his rescue. V. first directed 50 of his sons to offer themselves up as a ransom for their cousin, and, on their refusing to do so, cursed them to become outcasts; but afterwards taught S'unah's'epha two hymns which, as he said, if sung by him at the sacrifice, would save his life. (In the genealogy of the *Râmâyana's*, there are 21 kings between Tris'anku and Ambarisha; in that of the *Vishnu's Purân'a*, 15 kings; and in the former, between Ikshwâku and Ambarisha, 27; and in the latter, between Ikshwâku and Ambarisha, the successor of Tris'anku, 43 kings.) The liberation of S'unah's'epha having been effected, and V. having continued his penance for another thousand years, the god Brahman conferred on him the dignity of a *Rishi*. But not yet satisfied with this distinction, he went on practising still fiercer austerities than those he had practised before. These the gods succeeded in depriving for a time of their spiritual efficacy, by sending him a heavenly nymph, *Menakâ*, who excited his worldly passions; still, in the end, he attained the rank of a *Maharshi*, or great Rishi. And, after two other thousand years of still more rigorous penance, which for a time was again interrupted by the allurements of a nymph, *Rambhâ*, whom the gods had sent for the same purpose as previously *Menakâ*, the gods, headed by Brahman, came to acknowledge that he had now become a Brahmarshi, or Brâhmanic Rishi; and Vasishth'ha himself was compelled to express acquiescence in the result he had achieved. For other legends relating to this contest between V. and Vasishth'ha, see vol. I. of John Muir's "Original Sanscrit Texts" (Lond. 1853); and the article *HARIS'CHANDRA*. Compare also *VISHNU*, the 7th Avatâra.—The name of V. is explained in the *Mârkand'eya-Purân'a* as representing a compound, *vi'sva*, "all," and *amitra*, "no-friend," and meaning "one who is no friend of all, *scil.*, the three worlds." The *Mahâbhârata*, however, explains it as *vi'sva*, with its final vowel lengthened, and *mitra*, friend, when it would imply that V. was "the friend of all, *scil.*, the gods;" and *Yâska*, the oldest writer who gives an etymology of this name, likewise renders it "friend of all." The former etymology would seem the more regular; but as in Vedic *inseparable* compounds the final vowel of the first part is frequently lengthened, the latter etymology is the preferable of the two.

VITACEÆ, also called **SARMENTACEÆ** and **AMPELIDEÆ**, a natural order of exogenous plants, of which the common vine may be regarded as the type. About 300

species are known, natives of warm and temperate climates, all shrubs, mostly climbing; with simple or compound leaves, with or without stipules, the lower leaves opposite, the upper ones alternate; the flower-stalks racemose, opposite to the leaves, sometimes (as in the vine), by abortion, changing into tendrils.—The only plant of the order of much value, in an economical point of view, is the Vine (q. v.), nor are there any fine fruits except its fruit (the grape), and that of species so closely allied to it as to be not improbably mere varieties; but species of the genus *Cissus* and of *Ampelopsis* (which may unite with *Cissus*) are sometimes planted for ornament. *Cissus antarctica* is the KANGAROO VINE of New Holland; and *Ampelopsis hederaea*, often called the VIRGINIAN CREEPER, is a frequent ornament of the fronts of houses in Britain, attaching itself to the wall by tendrils terminating in a peculiar kind of sucker, and climbing to a great height.

VITAL STATISTICS. The annual Reports of the Registrars-general for England and Scotland (see REGISTRATION) form a valuable storehouse of information on the various subjects connected with vital statistics. Besides detailed abstracts for each year of births, marriages, and deaths, tables of the fatal diseases, classified in combination with ages, are given, and comments upon the salient points of the year's registration accompany the whole. The number of births, marriages, and deaths varies with the state of trade, price of food, and the seasons, and thus furnishes a test of the condition of a nation. We shall notice separately each of these three divisions of vital statistics.

1. *Births.*—From the 34th Report of the Registrar-general for England. It appears that the number of children born alive and registered during the year 1871 was 797,428, the population for the middle of that year being estimated at 22,782,812; the birth-rate being thus 35 per 1000 to the population. The proportion of the sexes was 104 boys to 100 girls. It is found on an average of ten years (1861–1871) that Cornwall, North Wales, Northumberland, Cumberland, Rutland, and Northampton have the largest proportion of male births; Hereford and Huntingdon the smallest. The proportion of male children is greater in the illegitimate than in the legitimate births. The registered percentage of illegitimate to the total births in 1871 was 5.6. Twenty years ago, the illegitimate were nearly 7 per cent. of the total births; in the ten years 1851–1860, the average was 6.5 per cent.; in the following ten years, 6.1 per cent. “I have no ground for supposing,” says the Registrar-general, “that the general diminution in the illegitimate birth-rate is caused by any increase in the omissions to register; on the contrary, I think that, as in those elements of registration which we have the means of accurately observing, undoubted progress in the direction of greater completeness has taken place, it is fair to assume with respect to the registration of illegitimate births, that at any rate no more of them are lost sight of now than in former years.” The birth-rate is usually highest in the first three months of the year; taking the mean of each of the quarterly rates during 34 years, the average annual births to 1000 persons living were 35.4 in the March, 35.1 in the June, 32.5 in the September, and 32.3 in the December quarters.

The direct cause of the increase of population in any country (apart from immigration) is, of course, the excess of births over deaths, and this will plainly depend on the following causes: (1.) on the prolificness of marriages; (2.) on the proportion born which lives to marry; and (3.) on the interval between the mean age of marriage and the mean age of death. All these conditions must be favorable to shew the full power of increase in action. They have never yet, on any large scale at least, been found operating with maximum force. In the United States, we find a combination of the first two; but from the “expectation of life” (see LIFE, MEAN DURATION OF) not being favorable in that country, it follows that the third cause is not in favorable operation.

2. *Marriages.*—It would seem to be contrary to the principles of human nature that early marriages should be united to longevity. Youthful marriages arise where the chances of the acquisition of wealth in youth are favorable; and when these are favorable the fact seems to tell against longevity. One of the most interesting and useful points of view in which registers can be considered is the evidence which they give of the varying prevalence of the prudential check to marriage and population in different countries and places. The prudential check will shew itself in two ways—either by the proportion of marriageable persons who are not married, or by the lateness of the average age of marrying. On the supposition of the natural

prolifficness of women remaining at the same point, the birth-rate will indicate the extent of prudential check in whichever of the two ways it may manifest itself. Suppose that from any cause the prudential restraint on marriage were to become weaker among any people than it had hitherto been, while the means of maintenance remained the same, what would happen? A corresponding increase would immediately take place in the annual mortality, and the mean duration of life would be correspondingly reduced. And there can be no doubt that the premature mortality which prevails all over the world is mainly owing to imprudent marriages. The death of one half of the human race under the age of puberty does not take place in virtue of any law of man's constitution, but from a disregard of the admonitions of its laws. Those who have the means of obedience under the conditions of civilised life generally greatly err; yet not so greatly, for the most part, as to be fatal to infant life. It is the want of means, in other words, imprudent marriages, which is the main cause. The following table is taken from an article "On the Statistics of Marriages among the Families of the Peerage," by Archibald Day, Esq. ("Assurance Magazine," No. 4S). The results as regards the peerage families are based on the data of a century to December 31, 1855:

PROPORTION PER CENT. OF MARRIAGES..

AGES.	Peerage Families.	England. (S. Brown.)		Belgium.	Massachusetts.	Poorer Classes. (St George's-in-the-East.)	Peerage Families.	1027 Peers. (Saddler.)
	First and Subsequent Marriages.	1846 1848	1851 1853	1841 1845	6½ Years to January 1857.	Statistical Society's Journal.	First Marriages only.	First Marriages only.
Under 30.	53.03	76.77	75.62	52.75	75.01	85.00	65.97	62.81
30 to 40...	83.98	18.31	19.22	39.93	19.54	14.06	31.63	27.75
45 to 60...	9.50	4.03	4.25	6.05	4.12	.94	2.40	7.83
60 and up.	3.44	.89	.91	1.27	1.33	0.00	0.00	1.56
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

In the above, column 1 shows the average rate of marriage at the given ages in the families of the peerage. Thus, of 100 persons married, it will, on an average, be found that 53.03 are under 30 years of age; and so on. Columns 2 and 3 give the same results for all England, as deduced by Mr S. Brown (see his paper in the "Assurance Magazine," vol. vii.). Column 4 is from M. Quetelet's observations in Belgium. Column 5 from a Report of the committee of the Statistical Society upon the poorer inhabitants of St George's-in-the-East in 1845. Column 6 was compiled by Mr Sadler, and will be found in the second volume of his work on the Law of Population. From the 34th Report of the Registrar-general for England, it appears that in 1871, in England, the number of persons married was 330,224, being 16,914 more than in the previous year, and 26,234 more than in 1869. In the 34 years, 1833—1871, the mean annual ratio of persons married was 1.65 per cent.; in 1871, the rate was 1.67 per cent. In the five years, 1841—1845, nearly 92 per cent of the marriages registered were solemnised according to the rites of the Established Church; in the five years, 1866—1870, the proportion was 77 per cent.; and in 1871 it was 76 per cent. On the other hand, marriages in the Superintendent Registrars' office requiring no religious ceremony whatever, have steadily increased from 2.3 per cent. of the total in 1841—1845 to 8.9 per cent. in 1866—1870, and to 9.7 per cent. in 1871. The mean age at marriage or remarriage in 1871 was for the men 27.9 years, and for the women 25.7 years. Curious instances are found in the tables of widowers of 60 and 70 marrying maidens of 15 and 19, of a bachelor of 75 wedding a spinster of 21, and of a bachelor of 21 marrying a spinster of 70. At 70 and upwards, 238 men and 82 women entered or re-entered into the married state.

3. *Deaths.*—The number of deaths registered in England in 1871 was 514,879, of

which 268,563, or 51·6 per cent., were males, and 249,316, or 48·4 per cent., were females. From the census returns of 1871, the male mortality rate in the first five years of life is shown to have been 71·7 per 1000, the female 63·4: at ages five and under ten, these rates were respectively 8·8 and 7·5; at ten to fifteen, when the rates are at their lowest, the male is 4·4, the female 4·5 per 1000; at 15 to 25, the rates are nearly equal, being 7·7 and 7·4; from 25 years of age, both male and female rates increase to the end of life, male being invariably the highest. With regard to cases of reputed centenarianism, the Registrar-general points out that while many are recorded, he has as a general rule "no alternative but to tell the tale as it is told to him;" but he notices a case, that of Jacob William Luning, whose death in 1870, at the age of 103, was proved to his, the Registrar-general's satisfaction, by documentary evidence. He adds that it is noteworthy that the experience of life assurance societies in this country gives but one example of an insured life completing its hundredth year, and that is the one of Luning. Nearly 13 millions of the population of England live in what are called the town districts, and the death-rate among these in 1871 was 25·5 per 1000, somewhat above the annual average; among the remaining ten millions, inhabiting the villages and rural districts, the rate was 19·6, being somewhat below the average. "For general purposes," says the report, "this comparison may be taken as giving a fair idea of the relative advantages, as regards the duration of life, which a residence in the country confers over one in town; bearing in mind, of course, that there are special causes of unhealthiness in some country-places, and that the towns themselves have a wide range of death-rate."

When any year is especially healthful, the fact tells most in favor of female life. The highest mortality rate during the 25 years, 1838—1863, both male and female, occurs in the cholera year 1849, the second highest in the famine year 1847, and the third highest in the cholera year 1854. For the three years, 1854—1856, it will be found that the mean male mortality is almost exactly that of the 25 years given, while the female rate is actually slightly (.006 per cent.) less. With regard, then, to the cholera visitation of 1854 at least, it may be held that the victims must have been generally those of diseased or debilitated constitution, who, had there been no cholera, would in course of the next year or so have died from some other cause. It is a curious fact in the experience of assurance offices, that while female annuitants are longer lived than male, female assured lives are no better. This fact doubtless arises from the critical periods incident to female life, and to the selection exercised by the public against the offices.

In 1871, the Scotch marriage rate was 14·2 per 1000, the birth-rate 34·5, and the death-rate 22·2; the marriage-rate was nearly 2·5 per 1000 below that of England, the birth-rates were almost identical, and the death-rate was .4 per 1000 lower in Scotland. The registered rates of persons married, of birth, and of death in Ireland in 1871, were 10·7, 28·1, and 16·5 per 1000 respectively—"these rates," says the report, "differ so widely from those of England and Scotland as to shew either that registration in Ireland is extremely defective, or that the constitution or the circumstances of the population is altogether different from that of Great Britain."

In vol. viii. (for 1860) of the "Assurance Magazine" will be found an interesting paper, by Mr Samuel Brown, F.S.S., "On Mortality amongst American Assured Lives." We extract the following table, showing the

AGE.	"EXPECTATION OF LIFE" ACCORDING TO			
	Mutual Life of New York, Fifteen Years.	"Actuaries," or Seventeen English Companies.	Massachusetts (1855) Tables (Elliott's.)	Farr's English, No. 1.
20	42·8	41·5	39·9	39·9
30	36	34·4	34	33·1
40	29·9	27·3	27·9	26·6
50	21·6	20·3	21·3	20
60	14·6	13·8	15	13·6
70	8·6	8·5	9·4	8·5

See also, on the subject of American mortality, the "Report of the Mutual Life Assurance Company of New York, for Fifteen Years ending February 1," 1858 (New York, November 1859).

Influence of Occupation.—The interesting question of the influence of different trades, occupations, and habits of life on health and mortality, will be found ably treated in Mr A. G. Finlaison's "Report on Friendly Societies," with accompanying tables and returns, printed by order of the House of Commons, August 16, 1853; in Mr Nelson's work on "Vital Statistics" (Lond. 1853); and in Mr H. Rafter's "Observation of Rate of Mortality and Sickness existing among Friendly Societies" (Manchester, 1850). From Mr Finlaison, we give the following table, shewing the

AGE.	MORTALITY PER CENT. AMONG						
	Mariners.	Colliers.	Metal Miners.	Painters.	Police.	Railway Servants.	England and Wales.
20	·66	1·11	·65	..	1·09	..	·74
25	1·71	·77	1·76	1·55	·57	·53	·71
30	1·69	·84	·81	·83	1·35	1·18	·77
35	2·26	1·67	1·03	·87	1·77	1·00	·63
40	1·79	·98	·29	2·04	2·05	1·56	1·08
45	2·71	1·09	2·00	2·09	·63	1·68	1·21
50	2·43	1·70	1·84	2·87	6·35	1·74	1·50
60	2·79	3·95	2·61	6·03	..	5·50	2·61

Among the mariners, a strong contrast is found to prevail between the sickness and mortality rates, the former being low while the latter is high. The same fact is found among painters. "The practical difference in the distribution of sickness," says Mr Finlaison, "seems to turn upon the amount of the expenditure of physical force. This is no new thing, for in all ages the enervation and decrepitude of the bodily frame has been observed to follow a prodigal waste of the mental or corporeal energies. But it has been nowhere previously established upon recorded experience that the quantum of sickness annually falling to the lot of man is in direct proportion to the demands upon his muscular power. So it would seem to be, however."—"Report," p. 211.

The following is from Mr Finlaison's Digest of Returns:

GENERAL AVERAGES.

	Number returned as sick out of each 100 persons liable to sickness.	Average Sickness per annum to each Person, expressed in Days.	Average Sickness per annum to each Person sick, expressed in Days.	Mortality per Cent.	Withdrawals and Exclusions per Cent.
Light labor <i>without</i> exposure to weather.....	21·68	9·5489	44·2438	1·43	2·97
Light labor <i>with</i> exposure to weather	20·80	8·5283	41·0053	1·37	2·83
Heavy labor <i>without</i> exposure to weather.....	26·54	10·8122	40·7349	1·33	3·08
Heavy labor <i>with</i> exposure to weather	28·04	10·6337	37·9960	1·07	3·02
England and Wales.....	24·99	10·1155	40·4809	1·26	3·00

In Mr Nelson's work will be found a valuable chapter on the rates of mortality among persons of intemperate habits. The following shows the period of years which there is an equal chance of living among the

Ages.	General Population of England and Wales.	PERSONS OF INTEMPERATE HABITS.	
20	44-212	15-537, being 35 per cent.	} of the duration of life in the general population.
30	36-482	13-800, " 33 "	
40	28-790	11-627, " 40 "	
50	21-255	10-860, " 51 "	
60	14-283	8-947, " 63 "	

The average duration of life, after the commencement of intemperate habits, Mr Nelson finds to be—among beer-drinkers, 21-7 years; spirit-drinkers, 16-7 years; indiscriminate, 16-1 years. Hence it appears that distilled liquors are more hurtful than fermented, but that both combined are worse than either taken separately.

The following table, from Mr Ratcliffe's work, shews the "expectation" at decennial periods of life, for England and Wales, Manchester Unity Order of Odd Fellows, and various trades:

England and Wales.— Rural, Town, and City; and various Trades.	AGE.				
	20	30	40	50	60
England and Wales.....	39-88	33-3	26-56	20-09	13-69
Manchester Unity.....	40-92	33-70	26-41	19-40	13-29
Bakers.....	41-92	34-05	26-58	20-09	14-12
Blacksmiths.....	37-96	30-34	23-52	18-11	13-02
Bricklayers.....	47-70	29-66	22-22	14-78	6-44
Butchers.....	41-60	33-49	26-33	20-89	14-69
Carpenters.....	45-28	35-47	31-65	25-07	18-88
Clerks.....	34-99	27-77	20-61	14-18	12-11
Coopers.....	35-62	31-17	24-23	18-92	13-22
Dyers.....	39-89	32-60	24-73	18-20	13-40
Hatters.....	38-91	34-29	27-93	19-57	12-59
Laborers (Town and City).....	40-87	33-65	26-27	19-07	13-33
" (Rural).....	45-32	37-71	29-91	22-18	15-2
Millwrights.....	40-32	33-88	27-37	19-60	13-69
Mill Operatives.....	33-09	30-43	22-61	15-55	10-61
Miners.....	38-22	31-65	24-28	17-82	12-27
Plumbers.....	38-18	31-59	24-67	18-24	12-67
Potters.....	36-59	30-61	23-80	19-74	13-71
Printers.....	36-66	28-86	20-55	14-67	12-04
Sawyers.....	40-02	33-06	26-05	18-04	13-11
Servants, Domestic.....	42-08	34-80	27-32	20-77	14-81
Shoemakers.....	40-87	33-99	26-28	19-04	13-08
Spinners.....	39-04	32-42	24-92	16-62	12-21
Stone-masons.....	38-19	30-41	24-16	18-15	14-79
Tailors.....	39-40	32-61	25-24	18-31	10-23
Weavers.....	41-92	35-65	29-58	22-01	15-61
Wheelwrights.....	40-97	33-87	27-54	19-41	13-84
Wool-combers.....	38-56	33-78	25-96	17-64	13-22

It thus appears that at the early period of life, age 20, the following trades, placed

according to their expectation, shew an inferior expectation in comparison with the general results of rural, town, and city districts combined: Clerks, potters, letter-press printers, bricklayers, blacksmiths, mill operatives, plumbers, stone-masons, miners, wool-combers, coopers, hatters, spinners, tailors, dyers, sawyers, mill-wrights, town and city laborers, and shoemakers. The following trades shew a superior expectation: wheelwrights, butchers, bakers, weavers, domestic servants, carpenters, and rural laborers.

At the last period given in the table, bricklayers, tailors, mill operatives, printers, clerks, spinners, miners, plumbers, hatters, blacksmiths, shoemakers, wool-combers, coopers, and sawyers shew an inferior expectation; and dyers, town laborers, mill-wrights, potters, wheelwrights, bakers, stone-masons, domestic servants, butchers, weavers, rural laborers, and carpenters, shew a superior expectation, in comparison with the general results.

The comparative healthiness of various occupations among the lower ranks in London is given by Dr Lethby for the years 1855-1856; and another view of the healthiness or unhealthiness of industrial occupations as regards England generally, is given by Dr Farr from the mortality of males at and above the age of 20 following different industrial occupations, in 1861, as compared with the number of persons enumerated in them at the census of that year. While the general annual rate of mortality in England, in 1851, of 1000 males at and above the age of 20, was 20, that of farmers was 23; shoemakers, 18; weavers, 17; grocers, 11; blacksmiths, 18; carpenters, 19; tailors, 19; laborers, 21; miners, 15; bakers, 17; butchers, 21; inn-keepers, 30. Taking into account the ages at death, the farmers were the longest lived. Laborers, who form nearly a fourth of the males of England, had a general mortality almost the same as that of the general population, but a very high mortality at great ages. At any one decade of life, the mortality of inn and beer-shop keepers exceeds that of all the other classes, except the butchers, at age 55-65. The mortality of butchers was much heavier than that of any other class, except that of innkeepers, under the age of 65; this fact is supposed to be owing to intemperance, slaughter-house effluvia, and the use of too much animal and too little vegetable food. All occupations have their peculiar dangers which counter-balance each other; thus the tailor is not exposed to the explosions so fatal to the miner, and the laborer has exercise denied to the tailor.

The mortality in the army and navy during peace and war shews many interesting points. Statistics tell us, that soldiers, though picked men, living in costly barracks in Britain during peace, are nearly as unhealthy as the people of our unhealthiest cities, and sometimes almost twice as unhealthy. The mortality at all ages in the army at home is almost double that of civilians, ages being alike. Lung diseases and cholera are twice as fatal to soldiers as to civilians. This excessive mortality in the army seems owing to overcrowded and ill-ventilated barracks and military hospitals, sameness of diet, and want of healthy exercise. In 1871, the strength of the entire British army abroad as well as at home was 192,665, of whom 106,767 were serving in the United Kingdom, and the remaining 86,908 were distributed in different parts of the world. The deaths occurring in the year out of the above numbers were, 1005 at home, and 1322 abroad, making altogether 2327. Proportionately to each 1000, there were at home 11.9 deaths of officers, and 9.4 of non-commissioned officers and men; abroad, 11.4 deaths of officers, and 15.4 of non-commissioned officers and men. The mean annual mortality of officers in the six years 1866-1871, was at the rate of 10.5 deaths per 1000 at home, and 12.6 abroad; among non-commissioned officers and men, the corresponding rates were 11.2 at home, and 18.3 abroad. Of the army at home, the mortality rate was considerably less among the 1216 officers stationed in Ireland than it was among the 3664 officers stationed in Great Britain. Of non-commissioned officers and men, 26,437 were stationed in Ireland, and their mortality rate was 8.5 per 1000, while it was 9.7 among the 74,440 stationed in Great Britain. "As the condition of the mercantile marine," says the Registrar-general, "is just now engaging a good deal of public attention, it may be worth while to see how that service compares in point of mortality with the naval service, and the general home population of corresponding age." The mean age, it appears, of the men afloat in the merchant service is about 28 years, while that of the men in Her Majesty's navy is about 26, so that there is really little difference in age between the two. Now the mortality among the English male population at

age 23 is by the "English Life Table" 9.7 per 1000; in the navy, the average annual rate of mortality in the period 1856-1872, was 14 per 1000; in the merchant service, from 1852-1871, it was 21 per 1000. The following table gives a comparison of the death-rate in the Royal Navy, and in the merchant service from disease and from accident:

	Deaths per 1000.	
	Royal Navy, Annual Average, 1856-1872.	Merchant Service, 1871.
From disease.....	10.	6.8
From injury or accident (including drowning).....	4.	14.9
All causes.....	14.	21.7

Thus it appears that in the navy about two-thirds of the deaths are the result of disease, while in the merchant service two-thirds of the deaths are the results of causes other than disease. Among the home population, at the sailors' ages the mortality from all kinds of violence does not exceed 1 per 1000. The dangers of the sea are now in the navy four times, and in the merchant service fifteen times as great as the dangers on land.

Mortality varies with density of population, place, and climate. It is a popular notion that a mild winter is most fatal to life, but the truth is the reverse. Either extreme cold or extreme heat immediately raises the mortality rate of Great Britain; the injurious effect of cold is in a great measure, however, confined to those whose circumstances do not enable them to protect themselves against it.

Some years ago, ten of the principal life-insurance offices of Scotland, with several of the leading English offices, contributed their experience down to 31st December 1863, as a basis of investigation into the mortality of assured lives. In England, the scheme was under a committee of the Institute of Actuaries; in Scotland, it was in charge of Mr James Meikle, actuary of the Scottish Provident Life Assurance Society. It has now been completed, and a valuable and elaborate work illustrative of its scope was published by Mr Meikle in 1872.

VITEBSK, a government in the north of West Russia, bounded on the n. w. by Courland and Livonia, and on the n. e. by the government of Pskov. Area, 17,425 sq. m.; pop. (1870) 888,727. The surface is, as a rule, hilly, though wooded plains, marshes, and lakes abound. The Dwina flows for 466 miles in this government; and by means of this River and its affluents, large quantities of timber are floated down to the port of Riga. The soil is not fertile, the quantity of cereals grown being generally insufficient for local consumption. Flax is successfully grown; and this material, together with timber, constitutes the chief articles of export. Ship-building is carried on the Dwina; the lake-fisheries are profitable; and tanning is the most important branch of industry.

VITEBSK, a city of West Russia, capital of the government of the same name, on both banks of the Western Dwina, 389 miles south of St. Petersburg. It covers a very large area, and contains many monasteries, churches, and synagogues. Manufactures are not extensive; and the trade—the chief articles of which are corn, flax, hemp, tobacco-leaves, sugar, and timber—is carried on by Jews, who form the larger section of the population. V. is connected by railway with Düna-burg and Smolensk. Pop. (1867) 28,944.

VITELLIUS. This name was, until recently, given by chemists to a supposed protein body occurring in the yolk of egg. It has been discovered by Lehman that this substance is merely an admixture of casein and albumen.

VITELLIUS, AULUS, Roman emperor, son of Lucius Vitellius, the prince of the sycophants who surrounded Caligula, but who, according to Tacitus, "in his provincial administration exhibited the virtues of a former age," was born Septem-

ber 25, 15 A. D., and through his father's influence at court, became consul, 48 A. D., and afterwards procursus of Africa, where his administration gave great satisfaction. He had been a companion of Tiberius at Capri, and was equally a favorite with Caligula, Claudius, Nero, and Galba, the last of whom appointed him commander of the legions in Lower Germany, thinking his intense devotion to gastronomic pleasures would effectually prevent his becoming a rival. However, V. had not been a month in his new post, till he had completely gained the affections of his soldiers by extreme familiarity and liberality (strongly contrasting with Galba's parsimony); and on January 3, 69, they took him from his tent, and proclaimed him emperor. This decision was adopted by the rest of the troops in Gaul; and two armies, under Valens and Cæcina, immediately set out to secure Rome, V. following leisurely. A notice of his contest with Otho in Northern Italy will be found under Otho. The adherents of his predecessor were leniently treated, with the exception of the centurions of Otho's army, who were put to death, an act which greatly offended his own supporters. V.'s journey to Rome was a curious specimen of a triumphant advance, the nominal conqueror being invariably muddled with liquor, and the soldiers of his army straggling about, committing excesses of all sorts with perfect impunity. At last he reached Rome, and without loss of time, proceeded, by right of his office as Pontifex Maximus, to deify Nero. The administration was mostly in the hands of the freedman Asulenus, though P. Sabinus (brother of Vespasian), and the two generals who had gained for him the imperial dignity, were high in authority; and the government was marked by great moderation, for V. was too far sunk in the vilest debauchery to be capable of tyranny. But he was not long allowed to disgust the respectable part of the citizens of Rome; for the legions of Pannonia and Illyricum, having proclaimed Vespasian emperor, advanced into Italy under Antonius Primus. They were opposed by the Vitellian troops, commanded by Cæcina, but through the treachery of the latter general, gained a decisive victory near Bedriacum, and another, on the following evening, over another Vitellian army which had marched to the support of the first. V., at this critical period of his fortunes, nothing abated his swinish indulgences; but his brother, Lucius, in the south, displayed more energy and defeated Vespasian's partisans in several battles. Meantime, the soldiers, enraged at the treachery of P. Sabinus, and his allies among the senators and knights, stormed the Capitol, and slew Sabinus. From this time, Rome was a scene of unintermitting violence and bloodshed, till the troops of Primus entered the city. V. was found wandering about his palace in a state of stupid terror, and after being ignominiously exposed in the streets, was killed by repeated blows, his head carried about Rome, and his body thrown into the Tiber, in December 69 A.D.—For a complete sketch of his private life, see Tacitus's "Historia," ii., iii., and Dion Cassius, 65; see also Suetonius, "Vit. Duodecim. Cæs."

VITELLUS OVI, or the *yolk* of the egg of the domestic fowl, is employed in pharmacy for the purpose of administering substances insoluble in water (the oils and resins, for example), in the form of emulsions. The *white* is employed as an antidote, in cases of poisoning by corrosive sublimate or with salts of copper. As a dietetic article in the sick-room, eggs, either lightly boiled or poached, or as ingredients of puddings, are invaluable; the stomach, after an acute disease, being often able to digest an egg, when any more solid article of animal food would set up gastric irritation.

The article **Egg**, **CHEMISTRY OF**, requires a few supplementary remarks. The albumen, occurring in the *white*, is for the most part in combination with soda; in addition to this principal ingredient, the white contains fats (chiefly margarin), grape-sugar (averaging 5 per cent. of the dried residue), and soluble salt, in which the chlorides preponderate, with a little silica (for the formation of feathers) and fluorine. The yolk consists of casein (forming 14 per cent.), albumen (about 8 per cent.), fat, some of which contain phosphorus (about 80 per cent.), a little grape-sugar, and mineral constituents (about 1.5 per cent.), in which there is a great preponderance of potassium compounds and phosphates. Of the pigments of the yolk we only know that there is both a yellow and red pigment, and that one at least of them contains iron. It is difficult to conceive a more concentrated form of nourishment than a food thus composed of casein, albumen, fat, sugar, potassium

salts, phosphates, and iron; and its resemblance in composition to milk is very remarkable.

The shell of the egg consists almost solely of carbonate of lime (about 97 per cent.), with a little phosphate of lime, and traces of magnesia and organic matter. The variety of color in the eggs of different birds is supposed to be due to certain modifications of bile-pigment with which they come in contact in the cloaca.

VITERBO, a city of Central Italy, in the province of Rome, stands amid gardens and vineyard, at the foot of Monte Cincino, 42 miles north-north-west of Rome. Its well-built streets are paved with marble, and there are numerous elegant fountains. Its Gothic cathedral contains the tombs of several popes, and is memorable as the scene where Guy de Montfort assassinated Prince Henry, brother of Henry III. of England. Among other attractive buildings are the churches, mostly rich in works of art, the bishop's palace, and the city halls. There are many monuments of antiquity in and around the city. Alum, vitriol, and sulphur abound in the neighborhood, and exquisite wines are produced. No important manufactures are carried on. Pop. (1871) 16,326.

VITEX, a genus of trees or shrubs of the natural order *Verbenaceæ*, the fruit a drupe, with a 4-celled stone. *V. Agnus castus*, the CHASTE TREE, a native of the countries around the Mediterranean, is downy, with digitate leaves white on the back, and has an acrid fruit, the seeds of which are used in Smyrna as an external application in cases of colic. It derives its name from the practice of Grecian matrons to strew their couches with its leaves, especially during the sacred rites of Ceres, in order to banish impure thoughts; for which purpose a syrup, made of its fruit, was also, and perhaps still is, used in convents in the south of Europe, although, in reality, it possesses stimulating properties.—*V. Negundo*, an Indian species, has aromatic leaves, which are bruised and applied to the temples for relief of headache.—*V. trifolia* is another Indian species, whose leaves are a powerful discutient.

VITILIGO was the name given by Celsus to some kind of cutaneous eruption which cannot be clearly identified. The term has, in recent times, been used by different writers in different senses, but is now most commonly employed to designate cutaneous patches characterised by loss of pigment.

VITIOUS INTROMISSION, in the Law of Scotland, means the unwarrantable interference and management of the movable estate of a deceased person. The consequence is, to make the intromitter liable for all the debts of the deceased person, though far exceeding the value of the assets. The mode of putting an end to this liability is to obtain confirmation as executor in the usual way.

VITORIA, a pleasant, gay, and thriving inland town in the north of Spain, capital of the province of Alava, stands on a gentle elevation, 70 miles west of Pamplona. The old town, the Villa Suso, consists of dark and tortuous streets; the new town is regularly laid out. There are several charming *alamedas*, or public walks, especially La Florida and El Prado. The Plaza Nueva, a square of 220 feet, was built in 1791, and under its arcades is the favorite promenade in winter. Brass and iron wares, earthenware, candles, and linen goods, are manufactured, and a brisk general trade is carried on with towns further inland. The plain surrounding the town is extensive and fruitful. The climate is temperate and healthy. Pop. 18,700.

V. will be ever memorable for the decisive and important victory which Wellington gained here over the French under Joseph Bonaparte and Jourdan, June 21, 1813. The numbers in this encounter was nearly equal. The French lost 6000 killed and wounded, 166 cannon, together with baggage, eagles, and an amount of booty in pictures, &c., which amounted to 5,000,000 dollars. The direct result of the battle of Vitoria was, that the French had to retire from Spain. About this engagement, Southey says the French "were beaten before the town, in the town, through the town, out of the town, behind the town, and all about the town." The loss of the British, Portuguese, and Spaniards was 4900 men.

VITRÉ, an ancient town of Brittany, France, in the dep. of Ille-et-Vilaine, on the left bank of the Vilaine, 24 miles east of Rennes by railway. It is a curious specimen of the old towns of the middle ages, and is still surrounded with Gothic

Vitrified
Vitravivus

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ramparts flanked with towers. At three miles' distance is the Château des Rochers, the celebrated residence of Madame de Sévigné. Manufactures of cloth and hats are carried on. Pop. (1872) 6901.

VITRIFIED FORTS, the name given to certain remarkable stone enclosures bearing traces of the action of fire, about fifty of which exist in parts of Scotland. They are generally situated on a small hill, overlooking a considerable valley, and consist of a wall, which may have originally been about 12 feet in height, enclosing a level area on the summit of the hill. The most remarkable feature of these structures is, that the wall is always more or less consolidated by the action of fire—in some cases only to the extent of giving a glassy coating to its inner side, while in other instances the vitrification has been more complete, the ruins assuming the character of vast masses of coarse glass. Structures of this kind are to be found at Noth and Dunnideer, in Aberdeenshire; Craig Phadrick, Tordun, and Glenever, in Invernesshire; Knockfarril, in Ross-shire; Creich, in Sutherlandshire; Dunskeig, in Argyleshire; Finhaven, in Forfarshire; and elsewhere, but principally in the northern counties. They were first noticed by Mr. John Williams, in his "Account of some Remarkable Ancient Ruins lately discovered in the Highlands and Northern Parts of Scotland," published in 1777. Mr. Williams's observations led him to conclude that they were artificial structures intentionally vitrified by a partial melting of their materials. Mr. Williams's views were combated by other writers, who contended that the supposed forts were of volcanic origin, a supposition quite irreconcilable with their obviously artificial character. In 1828, the subject engaged the attention of the Society of Antiquaries of Scotland, a series of careful observations being made by Dr. Samuel Hibbert, one of the secretaries of that body; and the conclusion arrived at was that while the structures were artificial, the vitrification was an accidental effect, which might have arisen from such causes as the frequent kindling of beacon fires as signals of war and invasion, or of bonfires forming a part of festive or religious rejoicings. The alkali produced from the accumulation of the ashes of continually blazing wood-fires would be a powerful aid to the fusion of stone. The view originally taken by Mr. Williams has since been supported by Dr. John McCulloch, who argues that the character of the works shews them to have been designed for defensive military posts, and observes, that in some cases where the most accessible materials for a stone-fort are incapable of vitrification, stones more capable of being vitrified have been brought from a distance. Dr. Petrie has noted one vitrified fort in the county of Cavan, and four in the county of Londonderry, and he conjectures that they belonged to the Irish Picts. A single instance, that of the "Camp of Pérán" in Brittany, occurs in France. In this case, only the central portion, or core, of the wall is vitrified, and in it a Roman roofing-tile was found by M. Lukis firmly attached to the melted stone. A number of the hill-forts of Bohemia have also been found to be constructed with a core of vitrified stones occupying the centre of the walls. Dr. Fodisch attributes them to the bronze age and to a Celtic race. More detailed descriptions of these Irish, Breton, and Bohemian examples, however, are necessary to enable us to pronounce definitely as to their identity with those of Scotland. But there seems to be little doubt that the vitrification in them all was the work of design, though produced, it may be, by different methods, and with structural intentions not quite the same.—See "Archæologia Scotica," vol. iv.; M'Culloch's "Highlands and Western Islands of Scotland;" Burton's "History of Scotland," chap. 3; "Proceedings Soc. Antiq. Scot.," vol. viii., p. 145.

VITRINGA, Campegius, an eminent Dutch divine and commentator, was born at Leuwarden in Friesland, 16th May 1659. He studied at Franeker and Leyden, at which last place he was created D.D. in his 20th year. In 1681, he was appointed Professor of Oriental Languages; and two years later, received the chair of Theology in the university of Franeker, where he died, March 21, 1722. V. is regarded as one of the most learned and laborious divines of his age, and has left many excellent and erudite works, chiefly commentaries on portions of the Scriptures, nearly all of which are in Latin. Among others may be mentioned, "Commentarius in Jesaiam;" "Anacrisis Apocalypsoe Johannis Apostoli;" "Commentarius in Jeremiam;" "Commentarius in Zechariam;" "Vetus Synagoga;" "Dissertationes Sacre;" "Typus Theologicæ Prophetiæ."

VITRIOL (derived from the Latin *vitrum*, glass) is a term which the early chemists applied to glass-like salts, distinguishing them by their colors into blue vitriol, green vitriol, and white vitriol. *Blue Vitriol* is still the popular name for sulphate of copper, which may be obtained on a large scale in various ways, but most simply by boiling copper in an iron pot with dilute sulphuric acid, by which means we obtain a salt having the formula, $\text{CuO} \cdot \text{SO}_3 + 5\text{Aq}$, and crystallising in oblique prisms of a clear blue color, which are soluble in four parts of cold, and two of boiling water, and when moistened, redden litmus paper. In large doses, it acts as a powerful irritant poison, unless, as is frequently the case, it is rejected by vomiting. In small but repeated doses (as from half a grain, gradually increased to two grains, made into pills with conserve of roses), it acts as a tonic and astringent, and will often check the discharges in cases of chronic diarrhoea and dysentery, when other medicines have failed; and according to Nelligan, it has been found serviceable in croup by checking excessive bronchial secretion. It has been much employed in cases of epilepsy, and is a valuable remedy in chorea and other spasmodic diseases, especially when they occur in weak constitutions about the period of puberty. Its use in doses of from 10 to 15 grains as an active emetic is mentioned in all works on materia medica; but sulphate of zinc in a dose of a scruple, is as efficacious, and safer. Externally, this salt in solution (varying from one to ten grains in an ounce of water) forms a good application to indolent ulcers, aphthæ, cancrum oris, and the sore throat in scarlatina; it is also used in chronic ophthalmia, and as an injection in cases of urethral or vaginal discharges. In the solid state, it is used as a caustic to repress excessive granulations (proud flesh), to destroy warts, and to excite indolent ulcers.

Green Vitriol is the popular name for sulphate of iron. Its characters, the method of obtaining it, and its therapeutic uses, are sufficiently noticed in the article IRON.

White Vitriol will be described in the article ZINC.

Oil of Vitriol is the old name given to commercial sulphuric acid, in consequence of its oily appearance, and of its being formerly obtained from green vitriol.

Elixir of Vitriol is the old name for the aromatic sulphuric acid of the Pharmacopœia. It is a mixture of three ounces of sulphuric acid and two pints of rectified spirit, in which powdered cinnamon and ginger have been digested. Its uses in doses of from ten to thirty minims, in a wine-glassful of water, are much the same as those of dilute sulphuric acid, but it is more agreeable to the taste, and sits more lightly on the stomach.

VITRO DI TRINA, the name given to a beautiful kind of glass which was made by the Venetians in the 16th century. Its distinguishing character is a series of wave-like marks in opaque colors, but usually white, arranged pretty regularly in the substance of transparent glass.

VITRUVIAN SCROLL, a continuous scroll-work forming a kind of cresting, used in classical architecture.

VITRUVIUS, the name of two Roman architects, the most celebrated of whom is **MARCUS VITRUVIUS POLLIO**, about whom we have no direct information further than the mention of his name by Pliny and Frontinus, though, from the references to himself in his own work, we can gather that in all probability he was born about 76 or 80 B. C. He received a liberal education, pursued specially those studies which were calculated to fit him for the profession of an engineer and architect, and was engaged in the African war (46 B. C.) as superintendent of military engines. He does not seem to have become very popular as an architect, and never succeeded in acquiring wealth, though the constant patronage which the emperor (Augustus) was induced by his sister (probably *Octavia Minor*) to extend to him, insured him comfortable subsistence during his life. The only public work he executed was a basilica at Fannum. V., in his book, "*De Architectura*," enters at some length into the reasons which induced him to write it, the chief of them being, the care bestowed by his patron (after settled peace had been secured to the empire) on buildings public and private, his intention to erect numerous edifices, and the danger that, owing to the depraved architectural taste of the time, the beauty and correctness of the pure Grecian models would be neglected. The "*De Architectura*" is arranged in ten books; the first of which contains a dedication to the emperor, a general view of

architectural science, hints as to the proper subjects of study for young aspirants, and directions for building cities; the *second* treats of the early history of architecture, and of the materials employed at various times, and contains a sketch of the physical theories of various philosophers; the *third* and *fourth* treat of the erection of temples, and in connection with this, of the four orders of architecture, Ionic, Corinthian, Doric, and Tuscan; the *fifth* treats of public buildings; the *sixth*, of private houses in town or country; the *seventh*, of the finishing and decoration of private buildings; the *eighth* of water, the mode of discovering it, whence it may be obtained, and the modes of conveying it in large quantities to a distance; the *ninth*, of the principles of gnomonics, the rules for dialling, and other subjects physical and astronomical; and the *tenth*, of machines used in building and in military warfare, of the mechanical powers, of mills, engines for raising water, odometers, &c. To each book there is a preface, more or less connected with the main subject of the book, and it is in these prefatory remarks that we discover what we know of V.'s personal history. There have been many editions of V.; the first was published along with Frontinus's "De Aquæductibus" at Rome about 1436, and afterwards at Florence (1496) and Venice (1497). Rude woodcuts were introduced into various subsequent editions; and the edition of Bode (Berl. 1800) has a volume of plates; but the best edition, that of J. G. Schneider (Leip., 3 vols. 1807-1808), is without illustrations.—See Smith's "Classical Dictionary of Biography and Mythology."

VITRY-LE FRANÇOIS, a town of France, in the dep. of Marne, on the right bank of the river Marne, 128 miles east of Paris by railway. The first site of the town was at Vitry-en-Perthois; but it was taken and burned by Charles V. in 1544. François I. rebuilt V. on its present site, surrounded with fosses and ramparts, and erected a castle for its protection. There are manufactures of hats and cotton goods. Pop. (1872) 6792.

VITTO'RIA, a modern town of Sicily, in the province of Siracusa, 18 miles north-west of Modica, on the Camaruna. It possesses little interest, and is made only a noonday resting-place for travellers. The soil of its vicinity, however, is fertile in fruits and wines, bee-culture is carried on, and the town maintains an active trade in silk and cattle. Pop. 17,600.

VITUS, ST., DANCE. See CHOREA.

VIVANDIÈRE, in continental armies, and especially that of France, a female attendant in a regiment, who sells spirits and other comforts, ministers to the sick, marches with the corps, and contrives to be a universal favorite. Although a familiar friend to all, these women contrive to maintain themselves respectable, and generally respected; and a corps is usually extremely jealous of the slightest discourtesy shewn to its vivandière. The woman wears the uniform of the regiment, short petticoats replacing the man's tunic.

VIVERRIDÆ, a family of *Carnivora*, having the body elongated, the claws partly retractile, the pupil of the eye circular during the day, and not contracted into a vertical line, as in the *Felidæ*, and, in general, a strong musky odor, proceeding from a secretion in a pouch near the anus. To this family belong the civet, genet, ichneumon, &c.

VIVIPAROUS FISH. It has been mentioned in the articles **FISHES** and **REPRODUCTION** that a few species of fishes are viviparous, or rather ovoviviparous, the eggs being hatched within the ovary. An example of this occurs in the Viviparous Blenny of the British coasts. See **BLENNY**. But it is the common characteristic of a whole family of the order *Pharyngognathæ*, therefore designated by the popular name of Viviparous Fish, and by the scientific name of *Embiotocidæ*—a name formed from the Greek, and signifying *viviparous*. The general aspect of fishes of this family is somewhat perch-like: the scales are cycloid, the gill-covers are entire; the lips are thick. On the north-west coast of America, from San Francisco to Sitka, species of this family are very abundant. They come into shallow water near the coasts, when the time approaches for producing their young, which is about the middle of summer. They swim in vast shoals, close to the surface, and have a peculiar habit of leaping high out of the water when alarmed, of which the Indians take advantage to capture them, by striking the water violently with their paddles, and uttering yells. The terrified fish leaping out of the water, many

of them fall into the canoes. The Indians also capture these fishes by thrusting a spear with four barbed points into the midst of a dense shoal. They can be easily taken by nets, but are not of great value for the table.

VIVISECTION—a term which is employed to designate operations performed with the knife on living animals, with the view (1) of increasing our physiological knowledge; (2) of confirming previously known facts; and (3) of giving dexterity in operative surgery—is a course of procedure which may be traced back to almost the earliest periods of medicine and surgery, and was largely practised in the Alexandrian School. It is, however, only comparatively lately—about half a century ago, when the barbarous experiments of Magendie, Brachet, and other distinguished French physiologists, became known in this country—that the subject has attracted much popular notice; and during the last ten years, attention has been so especially drawn to the atrocities systematically carried on in the great French veterinary colleges at Alfort and Lyon, that a deputation of "The Royal Society for the Prevention of Cruelty to Animals" laid a statement of the facts before the Emperor Napoleon. When it is stated, that with the nominal object of teaching the veterinary students at Alfort to become skillful operators, six living horses were supplied to them twice a week—that sixty-four operations were performed on each horse, and that four or five horses generally died before half the operations were completed—that it takes nearly two days to go through the list—and that all the old exploded operations, as well as those now practised, were performed—and lastly, when it is borne in mind that most, if not all, these operations could just as instructively have been practised on the dead animal (as is done in this country), there cannot be a doubt that a vast amount of unwarrantable and gratuitous cruelty was carried on in these establishments. Although the subject was brought before the *Académie des Sciences*, and warmly discussed, the final conclusion was, "that the complaints of the London Society are totally without foundation; and that there is no occasion to take any notice of them." We believe that it is only by the veterinary colleges of France that the view is advocated that vivisection is necessary for the purpose of giving dexterity in surgical operations.* But while all right-minded persons—except the majority of the members of the French Assembly, whose votes were probably influenced by a feeling of nationality—must concur in the view, that the argument in favor of vivisection utterly breaks down, some go further and doubt whether any experiments on living animals, performed with the object of advancing medical and surgical knowledge, and of thereby relieving, indirectly, human suffering, or prolonging human life, are, on moral grounds, to be regarded as justifiable. In opposition to this view, it is maintained that, under certain circumstances, and with due restrictions, such experiments are not only justifiable, but their performance becomes a positive duty. It may be observed that, though in stating this controversy the term vivisection is retained, the remarks apply to all kinds of experiments on living animals. It is universally admitted that man may destroy animals for his food, and to furnish him with many of the necessities and luxuries of life; and most persons go a step further, and see no impropriety in the pursuit of field-sports. Now, as Mr. Markham argues in his excellent prize essay on this subject, in all these cases of admittedly legitimate destruction of animal life, the infliction of pain is a necessary ingredient. In some modes of destruction, the death-blow is dealt at once, and the pain is but fleeting; whilst in others, the agony of the death-struggle is equivalent to a prolonged and painful torture. An ox may be at once stunned, while the animal bled to death suffers prolonged convulsive struggles. The humanitarian, if he be a sportsman, thinks little of the lingering pain which a wounded bird or broken-legged hare endures; nor, if he be engaged in the whale-fishery, does he lament over the prolonged suffering which the object of his pursuit must suffer before its capture. If, then, man can legitimately put animals to a painful death in order to supply himself with food and luxuries, why may he not also legitimately put animals to pain, and even to death, for the far higher and more noble object of relieving the sufferings of humanity, and of prolonging human life? To point out what pain has accrued to physiology (and hence, indirectly, to the healing art) by experiments on living animals, would occupy many pages of this work. It

*"Vivisection: is it necessary or justifiable?" Being two prize essays, published by the Royal Society for the Prevention of Cruelty to Animals (Lond. 1866).

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is sufficient to allude to the facts, that the doctrine of the circulation of the blood, and of the existence of, and circulation through, the lacteals, was thus established, and that nearly the whole of our present knowledge of the functions of the nervous system has been thus obtained and could never have been afforded by the most minute anatomical research, and that in consequence of the knowledge thus obtained we no longer divide a motor nerve, and thus paralyze the face, in the hope of relieving *tic douloureux*; while, on the other hand, thanks to the researches of Brown-Sequard, Bernard, and others, we can now see our way to a more rational mode of treating epilepsy, various obscure forms of paralysis, &c. Without vivisection, we could never clearly have understood the causes of the sounds of the heart, without the knowledge of which the stethoscope would have been useless in the diagnosis of cardiac diseases; nor should we have known anything of the true nature of that mysterious disease, diabetes. The Hunterian treatment of aneurism by ligature, which has saved hundreds of human lives, was worked out by experiments on living animals. The study of anæsthetics, which, after prolonged investigation, led to the introduction of chloroform (soon, possibly, to be superseded by some even less dangerous agent), was unquestionably accompanied by the suffocation of many animals; but surely no one who can form any estimate of the vast amount of misery which has been spared to humanity by the general introduction of the use of chloroform into surgical and midwifery practice, can regret the sacrifice. Indeed, the advantage of the discovery is experienced in more ways than one upon the lower animals, since the domestic animals are subjected to its beneficent influence when surgical operations are necessary, and since, in most cases, animals subjected to physiological experiments are now usually rendered insensible by it. If such questions as—the best means of restoring to life persons apparently drowned—why chloroform sometimes kills, and how those who are suffering under apparently fatal effects can be best recovered—admit, as they doubtless must, of a solution, that solution must be sought for in experiments on living animals. These and a multitude of similar considerations which might be adduced, are sufficient, it is maintained, to lead any unbiassed inquirer to the conclusion that experiments on living animals, performed with the object of advancing medical, surgical, or toxicological knowledge, and of thereby indirectly relieving human suffering, or of prolonging human life, are not only justifiable, but a matter of duty.

At the meeting of the British Association held at Liverpool in 1870, the general committee requested the committee of section D. (Biology) to draw up a statement of their views on physiological experiments in their various bearings, and they further requested the committee to consider “from time to time whether any steps can be taken by them, or by the association, which will tend to reduce to its minimum the suffering entailed by legitimate physiological inquiries.” Accordingly, at the meeting of the association at Edinburgh in 1871, the biological committee gave in a report, in which the following resolutions were presented: 1. That no experiment which can be performed under the influence of an anæsthetic ought to be done without it; 2. That no painful experiment is justified for the mere purpose of illustrating a law or fact already demonstrated; 3. Whenever, for the investigation of new truth, it is necessary to make a painful experiment, every effort should be made to insure success, so that the suffering inflicted may not be wasted—that, therefore, no painful experiment ought to be performed by an unskilled person, or in an unsuitable place; 4. In the scientific preparation for veterinary practice, operations ought not to be performed on living animals for the purpose of obtaining manual dexterity. On the reception of this report, a standing committee was appointed for the purpose of carrying out, with all the influence of the British Association, the above humane suggestions.

A still more satisfactory result, however, was the Interference (following upon the report of a Royal Commission) of Parliament, which in the year 1876, gave its assent to a bill to amend the law relating to cruelty to animals, the purpose of which was the restriction, or better regulation, of vivisection. The provisions of this Act coincide to a great extent with the resolutions of the committee as given above, and require that every one performing a painful experiment upon a living animal (which must be with a view of advancing physiological knowledge or knowledge which will be useful for saving or prolonging life or alleviating suffering), must hold a license from one of Her Majesty's principal Secretaries of State. Persons holding a condi-

tional license are allowed to perform such experiments only in a registered place, while the same rule applies to experiments performed for the sake of instruction (which, however, are permitted only under certain stringent limitations). Special protection is afforded to horses, asses, mules, dogs, and cats. The Act does not apply to invertebrate animals.

VIZIER, or **Vizir** (pronounced *viz-ir*), the title of various high functionaries in the Ottoman Empire, and other Mohammedan states. The word, which is of Arabic origin, and signifies "he who bears or supports (a burden)," was first bestowed as a title of honor on the chief-minister of the first Abbasside calif, in 750 A.D. During the decline of this dynasty, the vizier had to "bear the burden" of government almost entirely, and consequently, increased so much in power and authority, that the califs thought it prudent to counteract his influence by the creation of the new dignity of *Emir-al-Omrah* (q. v.), which, being generally bestowed upon one or other of the powerful alien princes who had made for themselves sovereignties in Persia, was found to be an efficacious counterpoise. The dignity of vizier was first introduced among the Ottoman Turks during the reign of their second sultan, Orkhan, and the title was exclusively confined to the sultan's prime-minister; but in 1396, it was conferred by Amurath I. on his victorious general, Timur-lash, and the prime-minister's title was then changed into *vizir-a-z'hem*, "grand or illustrious vizier." From this period, the number of viziers was gradually increased, but since the commencement of the 18th c., only seven of them are ministers, the "grand vizier," and the six "viziers of the cupola," who constitute the *Divan* (q. v.). The grand vizier is, after the sultan, the most important personage of the Turkish Empire; he unites in his own person the whole powers of the state, and is charged with a corresponding responsibility. The other six viziers in the *divan*, who are generally men well versed in law, and practically acquainted with the details of administration, from a council of advice, to whom the grand vizier applies when he thinks proper, but who possess otherwise no real power. The grand vizier, on his nomination, receives a sheet of parchment, on which is engraved the name of the sultan, and this he is bound always to carry in his bosom.—The title of vizier is also given to all the Pashas (q. v.) of three fells.

VIZZINI, a town of Sicily, in the province of Catania, and 39 miles south-west of the city of that name, stands on a hill. It is well built, and besides containing a college and a hospital there are a number of handsome buildings and churches, containing many fine pictures. Fruits in abundance are produced, and agates are found. Pop. 14,950.

VLAA'RDINGEN, an unwalld town in South Holland, lies about five miles west from Rotterdam, at a short distance from the New Maas. It has a good haven, and sends annually a large fleet of vessels to the herring-fishing, besides carrying on a considerable shipping-trade with the Mediterranean, Norway, North America, Portugal, and Spain. The pop., 1st Jan. 1875, was 9049. Besides the herring and cod fishing and shipping-trade, the industries are: shipbuilding, rope-spinning, distilling gin, sawing wood, grinding corn, boiling oil, tar, &c. V. is one of the oldest towns in South Holland, the church now called the Reformed Church having been consecrated by Willebrord in the 7th c., but nearly rebuilt in 1744. It was the birthplace of the poets Arnold Hoogvliet (1687—1763) and Jacob van Dijk (1745—1828).

VLADIMIR, the name of two celebrated Russian princes, the former of whom, **VLADIMIR SVIATOSLAVITCH**, was the first Christian sovereign of Russia. On the death of his father (972), V., though illegitimate, received Novgorod as his share of the heritage, but was driven out by Jaropolk, who had already murdered the third brother Oleg. However, V., by the aid of a body of Varangians (from Scandinavia), returned and overcame Jaropolk, by whose assassination (980) he became sole ruler in Russia. Disembarrassing himself of his dangerous allies by persuading them to take service with the Byzantine emperor, he next recovered by force from the Poles the provinces of which they had deprived his brother, and subdued various tribes which had recently revolted. Russia at this time was an ill-compacted empire; the various Slavic tribes which dwelt within its boundaries acknowledged the sovereignty of the Russian princes solely by the payment of tribute, and that only when the princes were powerful enough to enforce it; hence it was the custom for the princes personally, or their delegates, to go their regular rounds after the fashion of

tax-collectors, backed up by a large armed retinue. V. tried to increase the central authority, and one of the means he adopted was the erection at his capital, Kiev, of the idol Perun (Thunder), the supreme divinity of the Slaves, and of the images of other inferior deities, Slave and Finnish. But a few years more effected a remarkable change; many of V.'s subjects were Greek Christians; his mother, Olga, had become one; besides, he wished to be allied with the Byzantine Imperial family; and moved by these and other reasons of personal or patriotic ambition, he resolved to turn Greek Christian. His mode of arriving at conversion and matrimony was as curious as effective; he first made an attack upon the Byzantine Empire, then sent an embassy to Constantinople, promising peace and his conversion, in exchange for the hand of Anna, the sister of Constantine IX.; threatening war in case of refusal. His demands were gladly complied with; and after his marriage and baptism at Kherson in 988, he returned to Kiev, destroyed all the idols, and commanded his subjects to be baptised. They had not the slightest objection to be baptised, if their feared and admired prince wished it; and for days the Dnieper was crowded with applicants for the first testing ordinance of Christianity. It could hardly have been expected that a conversion managed in such a fashion would have affected the manners and conduct of such an arbitrary, violent, and daring prince as V.; yet, strange to say, from 988 he appeared to have undergone a thorough mental and moral transformation; churches were built, schools established, capital punishment was supplanted by a fine, and such excessive lenity shewn to all criminals, that in the interests of good government, it was found necessary to remonstrate with the thorough-going convert. Formerly, the wisdom and valor for which he was renowned were equalled by his licentiousness, so that the chronicles had more than one reason for saying that "he was like unto Solomon;" but the strictest chastity characterized the latter part of his life; and his charity to the poor, and personal forbearance, were extreme. He died in 1014, three years after his wife Anna. The Russian Church has decreed him the epithets of "saint," and "equal of the apostles."—VLADIMIR II. VSEVOLODOVITCH, surnamed *Monomachus*, grand-prince of Kiev, the great-grandson of the preceding, was born in 1053. His father being a younger son, there seemed to be little chance of V.'s attaining power in the ordinary course of events, in his own country; and he accordingly led a band of auxiliaries to join Boleslas II. of Poland in his wars with Bohemia; gaining such renown, as on his return ranked him at the head of Russian warriors. V.'s father having, as the eldest of the Russian princes, succeeded to the grand principality of Kiev (1078), V. took advantage of the opportunity to wrest from their lawful possessors, Smolensk, Tchernigov, and Novgorod; though some years afterwards, his cousin Oleg, the dispossessed prince of Tchernigov, with the aid of the Polotzoe or Cumans (a Turkish nation which was at that time the terror of the Russians), recovered his dominion. V. having subsequently routed the Polotzoe in several engagements, became so popular, that in 1118 he was chosen grand-prince of Kiev, and for 18 years displayed his eminent qualities as a ruler and a warrior. The maintenance of internal tranquillity, the improvement of old, and the building of new towns, and the encouragement of commerce, on the one hand; and the successful campaigns against the Tchudes, Poles, Polotzoe, and Bulgars (a Mohammedan commercial people settled on the Volga), on the other, are the principal characteristics of his reign. Most of V.'s fame, however, rests on his writings, which present an interesting picture of the internal life of Russia in the 11th c., and indicate prominently the earnest practical influence of the newly introduced Christianity. V.'s mother was a daughter of Constantine Monomachus; and Alexis Comnenus, who wished to be on good terms with his powerful northern neighbor, is said to have sent him the crown, sceptre, and sword of his grandfather, which are still shewn as such, and which are employed in the coronation of the czar.

VLADIMIR, a government of Russia, bounded on the e. by the government of Nijni-Novgorod, and on the s.-w. by that of Moscow. Area, 18,796 sq. m.; pop. (1870) 1,258,928. The surface is level or undulating; the soil consists chiefly of clay or sand, and is fertile only in exceptional spots. The principal rivers are the Oka and its tributaries, of which the chief is the Kliasma, a navigable stream. Of the lakes, which are numerous, but of inconsiderable size, that of Pereliaslav is remarkable for its productive fisheries, and is famous in history as being the cradle of the Russian fleet. After St Petersburg and Moscow, the government of V. is the most

actively industrious in the Russian Empire. Of its manufactured goods, cotton-yarn and cloth are made to the value of 13,000,000 roubles annually; chiniz and dyed goods, 12,000,000 roubles; linen, 2,000,000 roubles; glass, 1,000,000 roubles; iron and brass foundries produce goods to the value of 1,000,000 roubles; and the manufactures of chemicals and paper are very extensive. The inhabitants are also much employed in painting images and in knitting stockings, which are used in Russia and Siberia, and yield 1,000,000 roubles per annum. The grain-crops raised are insufficient for local consumption, and corn is imported from neighboring governments. Hemp is successfully grown; and besides being used in considerable quantities in local manufactures, is exported to Archangel and St Petersburg. Forests, mostly of pine, form a border round the government, but do not occur in the interior. In the 9th c., the country was inhabited by Finns; and though it was subsequently conquered and settled by the Slavonians, traces of the original inhabitants are visible in the present population.

VLADIMIR, a town of Great Russia, capital of the government of the same name, stands on the left bank of the Kliasna, which is high and wooded, 125 miles north-east of Moscow. It was founded in the 12th c., during the ascendancy of the Dukes of Vladimir, and was the capital of Russia till 1828. It contains many historical remains, as the Kremlin; the "golden gate," built in 1158; ruins of old fortifications, and many ancient churches. The ecclesiastical seminary is important. There are several manufactures and a trade in corn. Cherries are a considerable local product. Pop. (1867) 15,478.

VOĐENA, a beautifully-situated town of European Turkey, in Rumili, on a mountain slope, 46 miles west-north-west of Saloniki. Water is here very abundant; torrents rush headlong down the middle of all the streets, and the sound of cascades is everywhere heard. The houses, from the archbishop's palace to the humblest cottage, are picturesque, but are not otherwise remarkable. The streets are wretchedly paved. V. occupies the site of the ancient Edessa, the early capital of Macedonia. Pop. estimated at 12,000.

VOGHERA, a city of Northern Italy, in the province of Pavia, stands on a fertile elevated plain, in a district rich in vineyards, orchards and cornfields, 24 miles east-north-east of Alessandria by railway. The Via Emilia passes through the town, and divides it into two parts. There are several handsome squares, of which that of the Duomo is the chief; the streets are adorned with porticoes; and there is an old castle, built by Galeazzo Visconti in 1372. The civic palace contains many valuable parchments and manuscripts of the 11th, 12th, and 13th centuries. Silks, linens, canvas, and leather are manufactured. Pop. 11,450.

VOICE (Lat. *vox*) may be defined as an audible sound produced by the larynx, and may be produced by any animal possessing that organ; while speech or articulate language may be regarded as voice modified in the cavity of the mouth. The Larynx (q. v.) is the organ by which the so-called *vocal sounds* (or primary elements of speech) are produced. In the article **LARYNX**, it is shewn that there are two groups of muscles, which respectively govern (1) the *pitch of the notes*, and (2) the *aperture of the larynx*. Those which affect the pitch of the notes are divisible into two antagonistic sub-groups, viz., (a) those which depress the front of the thyroid cartilage on the cricoid, and *stretch* the vocal ligaments; and (b) those which elevate the front of the thyroid cartilage, and *relax* the vocal ligaments; while those which control the aperture of the glottis are divisible into (c) those which *open* it, and (d) those which *close* it. It is only the first of these groups, viz., the muscles which stretch or relax the vocal ligaments, that is concerned in the production of voice. In the ordinary condition of rest, there is a wide opening between the vocal ligaments, which are in a state of complete relaxation, and the air passes freely between them. For our knowledge of the appearances presented under varying conditions by the interior of the larynx, we are mainly indebted to Professor Czerniak, the inventor of the Laryngoscope (q. v.); and the reader who wishes to enter fully into this subject, is referred to his work on that instrument, of which a translation was published by the New Sydenham Society in 1861. He gives figures representing respectively the condition of the larynx as seen during tranquil respiration, its condition during the emission of the broad vocal sound A, and its con-

dition during the emission of a high or acute sound. The movements of the arytenoid cartilages during the production of vocal sounds can be distinctly seen—the views that had been previously deduced, from theory and experiments on the dead subject, being thus confirmed by ocular proof. As soon as we wish to utter a sound, the two arytenoid cartilages raise themselves in the fold of mucous membrane which covers them, and approach one another with surprising mobility. This movement effects the approximation of the vocal cords, and consequently the contraction of the glottis. It is impossible to study with the laryngoscope the mode of formation of the gravest chest-sounds, because the arytenoid cartilages become so raised that they almost come in contact with one another, while they bend under the border of the depressed epiglottis, and thus conceal the interior of the larynx. During the emission of the most acute sounds, the glottis contracts into a mere line, on each side of which the vocal cords may be recognised by their whitish-yellow color; while farther outward, and separated from the former by a narrow groove, are the false or superior vocal cords of either side. The arytenoid cartilages are raised, and come in contact in the median line, the epiglottis is drawn outwards, and a short stiff tube is then formed above the glottis; all these parts being, as we learn from our sensations during the experiment, in a state of very great tension. Independently, however, of such observations as those we have recorded from Czermak's interesting Memoir, any one may easily prove for himself that the aperture of the glottis is much contracted during the production of sounds, by comparing the time occupied by an ordinary expiration with that required for the passage of the same quantity of air during the maintenance of a vocal sound; moreover, the size of the aperture varies with the note that is being produced, as may be readily seen by any one who compares the time during which he can hold out a low and high note. When the distance between the vocal cords exceeds one-tenth of an inch, no sound can be produced.

How the vocal cords produce sounds, is a question which has long attracted the attention of physiologists and physicists. To answer it, they were compared with various musical instruments. More than a century ago, Ferrein ("De la Formation de la Voix de l'Homme," 1741) compared them to vibrating strings; and at first sight, there is an apparent analogy; but on further investigation (for reasons which may be found in Carpenter's "Human Physiology" 6th ed., p. 715), this view was found to be untenable. The analogues between the organ of voice and the *flute-pipe*, in which the sound is produced by the vibration of an elastic column of air contained in a tube, were then investigated, but found to fail. The third class of instruments with which the human organ of voice has been compared are vibratory *reeds* or *tongues*, which may either possess elasticity in themselves, or be made elastic by tension. From the experiments of Weber, it appears that the action of the larynx has more analogy to that of reed-instruments than to the instruments previously named, and though there would seem at first sight to be a marked difference between the vocal ligaments and the membranous tongue of any reed-instrument, this difference is not very great. Müller ascertained that membranous tongues made elastic by tension may have three different forms, of which the following, which alone concerns us, is one: "Two elastic membranes may be extended across the mouth of a short tube, each covering a portion of the opening, and having a chink left open between them." Here there is clearly an approximation to the human glottis, which may be increased by prolonging the membranes in a direction parallel to that of the current of air, so that not merely their edges but their whole planes shall be thrown into vibration. Professor Willis has, upon this principle, invented an *artificial glottis*, in which the vocal ligaments are imitated by leather, or preferably by sheet india-rubber. It is composed of a wooden pipe, having a foot, like that of an organ-pipe, and an upper opening, long and narrow, with a point, rising at one end of it. A piece of leather or sheet india-rubber doubled round this point, and secured by being bound with strong thread, will form an artificial glottis, while its upper edges are capable of vibrating or not by inclining the planes of the edges. Two pieces of cork are glued to the corners to make them more manageable. From this machine, various notes may be obtained by stretching the edges of the leather in the directions of their length; the scale of notes yielded by leather is much more limited than that yielded by india-rubber; and other observers have found that the middle coat of the arteries in a moist state (as being more elastic, and

almost identical in structure with the vocal ligaments), yields more satisfactory results even than india-rubber. "It is worthy of remark," as Dr Carpenter observes, "that in all such experiments it is found that the two membranes may be thrown into vibration, when inclined *towards* each other in various degrees, or even when they are in parallel planes, and their edges only approximate; but that the least inclination *from* each other (which is the position the vocal ligaments have during the ordinary state of the glottis) completely prevents any sonorous vibrations from being produced."—*Op. cit.*, p. 118. The *pitch* of the notes produced by membranous tongues may be affected in various ways (as by increasing the strength of the blast, the addition of a pipe, &c.), and is mainly governed by their degree of tension, while the foregoing statements shew that the sound of the voice is the result of the vibrations of the vocal ligaments which take place according to the same laws with those of elastic tongues generally. Little is, however, known with certainty regarding the mode and degree in which the tones are modified by the shape of the air-passages generally, the force of the blast of air, and other circumstances.

The *falsetto* is a peculiar modification of voice, differing from the ordinary or *chest voice*, not only in the higher pitch of the notes, but also in their quality. The theory of its production is still an open point, into which we have not space to enter, further than to remark that, according to Professor Wheatstone, falsetto notes are to be explained by supposing that "the column of air in the trachea may divide itself into *harmonic lengths*, and may produce a *reciprocation* of the tone given by the vocal ligaments."

The pressure of the air within the trachea during the production of voice is very considerable. From observations made by Cagniard-Latour on a man with a fistulous opening in the trachea, it was found that when the patient called out at the top of his voice, the pressure was equal to that of a column of water 88 inches in height; when he spoke at his usual pitch, to one of 5 inches; and when he sang in a high note, to one of about 8 inches. The glottis has been well chosen by Dr Carpenter to illustrate the minute precision with which the degree of muscular contraction can be adapted to the desired effect. The musical pitch of the tones produced by it is, as we have shewn, regulated by the degree of tension of the elastic vocal ligaments. Their average length, in a state of repose, is 78-100ths of an inch; while in the state of greatest tension, it is about 98-100ths—the difference being thus *one-fifth* of an inch; while in the female the respective lengths are 61-100ths and 68-100ths respectively—the difference being thus about *one-eighth* of an inch. Now, the natural compass of the voice, in persons who have cultivated the vocal organ, is about two octaves, or 24 semitones. Within each semitone, an ordinary singer could produce at least ten distinct intervals (the celebrated Madame Mara could sound 100 different intervals between each tone, the compass of her voice being 21 tones), so that 240 is a very moderate estimate of the number of different states of tension of the vocal cords, every one of which can be produced at will; and the *whole* variation in the length of the cord being not more than one-fifth of an inch, even in man, the variation required to pass from one interval to another will not be more than 1-1200th of an inch (while in such a case as that of Madame Mara the distance would be reduced to 1-17,000th of an inch).

In the production of vocal sounds, the delicate adjustment of the muscles of the larynx, which is requisite to the evolution of determinate tones, is directed by the sense of hearing, being originally learned under the guidance of the sounds actually produced; but "being subsequently effected voluntarily, in accordance with the mental conception of the tone to be uttered, which conception cannot be formed unless the sense of hearing has previously brought similar tones to the mind. Hence it is that persons who are born *deaf* are also *dumb*. They may have no malformation of the organs of speech, but they are incapable of uttering distinct vocal sounds, or musical tones, because they have not the guiding conception, or recalled sensation, of the nature of these. By long training, however, and by imitative efforts directed by muscular sensations in the larynx itself, some persons thus circumstanced have acquired the power of speech; but the want of a sufficiently definite control over the vocal muscles is always very evident in their use of the organ."—*Op. cit.*, p. 556. A fund of interesting matter in connection with this subject may be found in Dr. Kitto's "Lost Senses." Although not born deaf, he became *completely* so in early childhood, in consequence of an accident. His voice became similar to that of

a person born deaf and dumb, and taught to speak. It was observed that the words which he had been accustomed to use before his accident, were still pronounced as they had been in childhood, the muscular movements concerned in their production having been still guided by the original auditory conception, while all the words subsequently learned were pronounced according to the spelling.

The various muscular actions which are concerned in the production of vocal tones, are commonly regarded as being under the influence of the will. It is, however, easy to shew that this is not the case. We cannot, by simply *willing* to do so, raise or depress the larynx, or move one cartilage of it towards or from another, or extend or relax the vocal ligaments; although "we can readily do any or all of these things by an act of the will, exerted for a specific purpose. We conceive of a tone to be produced, and we *will* to produce it; a certain combination of the muscular actions of the larynx then takes place, in most exact accordance with one another, and the predetermined tone is the result. This anticipated or conceived sensation is the guide to the muscular movements, when as yet the utterance of the voice has not taken place; but while we are in the act of speaking or singing, the contractile actions are regulated by the present sensations, derived from the sounds as they are produced." From these remarks, in which Dr. Carpenter has placed a very difficult subject in as clear a light as the subject admits of, it follows that the muscular actions which are concerned in the production and regulation of the voice, are due to an *automatic* impulse, similar to what occurs in the movements of the eyeball, and in many other cases that might be adduced. There cannot be a doubt that the simple utterance of sounds is in itself an instinctive action; although the combination of these sounds into music or into articulate language, is a matter of acquirement.

Having explained the way in which the larynx produces those tones of which the voice fundamentally consists, and the sequence of which becomes music, we come to the subject of *speech*, which consists in the modification of the laryngeal tones by other organs superior and anterior to the larynx (as the tongue, the cavity of the fauces, the lips, teeth, and palate, with its velum and the uvula acting as a valve between the throat and nostrils), so as to produce those *articulate sounds* of which language is formed. The organ of voice is thus capable of forming a large number of simple sounds, which may be combined into groups, forming words. Vocal sounds are divided into vowels and consonants. When a vowel is pronounced, what happens? This question is thus answered by Professor Max Müller: "Breath is emitted from the lungs, and some kind of tube is formed by the mouth, through which, as through a clarinet, the breath has to pass before it reaches the outer air. If, while the breath passes through the vocal cords, these elastic laminae are made to vibrate periodically, the number of their vibrations determines the pitch of our voice, but it has nothing to do with its *timbre*, or vowel. What we call vowels are neither more nor less than the qualities, or colors, or *timbres* of our voice, and these are determined by the form of the vibrations, which form, again, is determined by the form of the buccal tube."—"Lectures on the Science of Language," 2d series, p. 116. This writer enters very fully into the various configurations of the mouth requisite for the formation of the different vowels. (1). In pronouncing *u* (the vowels are all understood to be pronounced as in Italian), we round the lips and draw down the tongue, so that the cavity of the mouth assumes the shape of a bottle without a neck. (2). If the lips are opened somewhat wider, and the tongue be somewhat raised, we hear the *o*. (3). If the lips are less rounded, and the tongue somewhat depressed, we hear the *ā* of the northern languages (as in *arguet*). (4). If the lips are wide open, and the tongue in its natural flat position, we hear *a*. (5). If the lips are fairly open, and the back of the tongue raised towards the palate, the larynx being raised at the same time, we hear the sound *e*. (6). If we raise the tongue higher still, and narrow the lips, we hear *i*. The buccal tube here represents a bottle with a very narrow neck, of no more than six centimètres (or about two inches and a quarter) from palate to lips. Diphthongs arise when, instead of pronouncing one vowel directly after another with two efforts of the voice, we produce a sound *during* the change from one position to the other, that would be required for each vowel. Though the tube of the mouth thus modified by the tongue and lips is the chief agent in the production of vowels, Czermak has proved that the *velum palati* is changed in position with each vowel,

and that it is lowest for *a*, and rises successively with *e*, *o*, *u*, and *i*, when it reaches its highest point. He likewise found that the cavity of the nose is more or less opened during the pronunciation of certain vowels. Languages might have been formed entirely of vowels, but the existing words, consisting solely of vowels, show how unpleasant such languages would have been. Something else was obviously wanted to supply what Max Müller happily terms *the bones of language*—namely, the consonants. These are commonly divided into (1) those which require a total stoppage of the breath at the moment previous to their being produced, and which cannot, therefore, be prolonged; and (2) those in pronouncing which the interruption is partial, and which, like the vowel sounds, can be prolonged at pleasure. The former are termed *explosive*, and the latter *continuous* consonants. In pronouncing the *explosive* consonants, the posterior openings of the nostrils are completely closed, so as to prevent the passage of air through the nose, and the current may be checked in the mouth in three ways—viz. (a) by the approximation of the lips; (b) by the approximation of the point of the tongue to the front of the palate; and (c) by the approximation of the middle of the tongue to the arch of the palate. The letters *b* and *p* are pronounced by the first of these modes; *d* and *t* by the second; and *g* (hard) and *k*, sounded as *key*, by the third; the difference between *b*, *d*, and *g*, on the one hand, and *p*, *t*, and *k*, depends upon the approximating surfaces being larger, and the breath being sent through them more strongly at the moment of opening in the former than in the latter group. The *continuous* consonants may be subdivided into three classes, according to the degree of freedom with which the air is allowed to escape, and the compression which it consequently experiences. In the *first* class, no air passes through the nose, and the parts of the mouth that produce the sound are closely approximated, so that the compression is considerable. This is the case with *v* and *f*, *z* and *s*, *ð* and *t*, *th*, *sh*, &c., the movement of the tongue being also concerned in the production of several of these sounds. In the *second* class, including *m*, *n*, *l*, *r*, the nostrils are not closed, and consequently, the air is scarcely at all compressed. In pronouncing *m* and *n*, the breath passes through the nose alone; *m* is a labial, like *b*, but the latter is formed with the nose closed. Hence the passage of *m* to *b* (as in *lamb*) is easy; so also is that from *n* to *t*, or from *n* to *g*, as is seen in the frequent combination of *nt* and *ng* in most languages. The sounds of *l* and *r* (letters which Max Müller places in a special group under the name of Trills) are produced, according to Helmholtz, as follows: "In pronouncing *r*, the stream of air is periodically entirely interrupted by the trembling of the soft palate, or of the tip of the tongue, and we then get an intermittent noise, the peculiar jarring quality of which is produced by these very intermissions. In pronouncing *l*, the moving soft lateral edges of the tongue produce, not entire interruptions, but oscillations in the force of air."—"Die Lehre von den Tonempfindungen," 1868, p. 116. The *third* class contains sounds which scarcely deserve to be called consonants, since they are merely *aspirations*, either simple, or modified by an elevation of the tongue, causing a slight obstruction to the passage of air, and an increased resonance in the back of the mouth. The present *h* and the Greek *χ* are examples of these sounds. The method of pronouncing these sounds is very fully discussed in Max Müller's "Lectures," 2d Series, pp. 127—136.

For further details, the reader is referred to the admirable chapter on "Voice and Speech" in Carpenter's "Human Physiology," and to Max Müller's "Lectures on the Science of Language" (from both of which we have borrowed largely in this article), to Mr Bishop's article "Voice" in the "Cyclopedia of Anatomy and Physiology;" and the various works of Funke, Helmholtz, Brücke, Czermak, Du Bois Raymond, &c., mentioned by Max Müller in his chapter on "the Physiological Alphabet."

VOIDED, in Heraldry, a term applied to an ordinary when its central area is removed, so that the field is seen through it, and little but a mere outline remains, as in Azure, a saltire voided argent. When the ordinary has its outer edge formed of any of the lines of partition other than dancetté, wavy, or nebuly, the voiding is nevertheless plain—Azure, a chevron engrailed voided or. An ordinary voided and couped differs from an ordinary couped and voided in so far as the former is open at the extremities, and the latter enclosed. One ordinary may sometimes be voided in the form of another, as a cross voided per pale.

VOIRE DIRE (*veritatem dicere*). In English Law, when a witness is supposed to be liable to objection for incompetency or otherwise, he is first sworn, not in the cause, but on the *voire dire*, that is, to answer questions relating to this incompetency; and if it is apparent that he is incompetent, he is discharged without further examination.

VOIRON, a town of France, in the dep. of Isère, beautifully situated on the Morge, 15 miles by railway north-west of Grenoble. Among the manufactures which are here carried on with great activity are to be mentioned blacksmiths' work, paper-making, nail-making, and tanning. Pop. (1873) 7500.

VO'LANT, in Heraldry, flying. A bird volant is represented flying bendways towards the dexter side of the shield; and its position may be distinguished from that of a bird rising by the legs being drawn up towards the body.

VOLCA'NOES are conical mountains which vomit flame and smoke, and occasionally throw out showers of ashes and stones, or eject melted rock on the surface of the earth. Volcanoes may have their origin on flat plains on the surface of the earth, or even at the bottom of the sea; but the gradual accumulation of the ejected material around the vent, through which it has been poured, forms in time a mountain, if it is allowed to remain. The waves swept away the cone of Grahame's Island (q. v.), which in 1831 appeared in the Mediterranean, scattering the lava and scorise of which it was composed at the bottom of the sea. When, however, the ejected materials are sufficiently compact to resist the action of the waves, a permanent island is produced, and sometimes increases in height with a rapidity that can scarcely be imagined. In 1796, a volume of smoke was seen to rise from the Pacific Ocean about 80 miles to the north of Unalaska. The ejected materials having raised the crater above the level of the water, flames issued from the islet, which illuminated the country for 10 miles around. Six years afterwards, when a few hunters landed on the new island, they found the soil in some places so hot that they could not walk upon it. Repeated eruptions have increased the dimensions of the island, until now it is several thousand feet in height, and between two and three miles in circumference. In the same region is the volcanic island of Klutachewak, which rises at once from the sea to the enormous height of 15,000 feet.

The lava, scorise, and ashes which are thrust out of the crater form highly inclined and more or less regular beds on the surface of the mountain, extending from the crater-mouth to varying distances down the sides of the volcano. This method of increase gives the uniform conical outline to volcanoes, without the terraces or breaks which are found in almost all other mountains. The sides are often furrowed longitudinally by straight narrow ravines, which increase in number towards the base. These are produced by the action of running water obtained from rain or from melting snows during an eruption. The rapidity with which floods rush down the steep sides of a volcano gives a prodigious force, which the loose scorise and ashes, and even the solid lava, cannot resist.

The grayish color of volcanic mountains is produced by the ash and scorise, which, though in composition the same as the dark lava, have this lighter color from the minute subdivision of their particles. When a particular series of rocks remain on the surface, and are not covered by the products of more recent eruptions, they weather and decompose, and produce a very fertile soil, which is speedily clothed with vegetation, and thus change the whole aspect of the formerly bare and uniformly-colored mountain.

The vent through which the materials are vomited forth is called the crater. This is a more or less circular opening, communicating with the source from which the ejected materials are obtained. The crater has generally one side much lower than the other—that from which the prevailing wind blows, which carries with it the showers of ashes to the opposite side of the mountain. In many cases, the cone is truncated; a wide hollow of immense extent, and often of great depth, in the base of which the crater is situated, occupies the summit. The Spanish name *Caldera* is technically applied to these hollows. Their origin has been a subject of considerable controversy. Von Buch and others maintain that they are craters of elevation; that is, that the rocks were originally spread out in nearly horizontal deposits, and then upheaved into a dome-shaped mountain, with the hollow caldera in the centre of its summit. The more satisfactory explanation is that the original cone, formed by the

alternate deposition of the lava and ashes ejected from the crater, has, from the great heat of the molten lava rising in the tube of the volcano, or from gaseous explosions, given way, and fallen in. The cones both of Etna and Vesuvius have frequently fallen in and been reproduced. In 1822, the summit of Vesuvius was reduced by 800 feet. The immense size of some calderas seems, however, opposed to this theory. That of the island of Palma, one of the Canaries, is from three to four geographical miles in diameter, and the precipices which surround the cavity are from 15.0 to 2000 feet in vertical height. They form an unbroken wall, except, at the south-western end, where a deep gorge permits the passage of the torrent which drains the caldera. The precipices are traversed by numerous vertical dikes, and exhibit all the appearances which would be produced by the falling-in of the huge summit of this once enormous volcano.

The pressure of the incandescent lava often forces for itself a passage to the surface before it reaches the mouth of the crater, and this is more frequently the case when the volcanic eruption is accompanied with earthquakes. Immense vertical fissures are found radiating from the centre of the volcanic action, and reaching the surface of the ground, and even rising to the summit of the mountain; these being filled with the molten rock, which in course of time solidifies and forms often a large portion of the mountain mass, as is shewn in the Val del Bové on Etna (q. v.). The lava sometimes pours out of these fissures instead of rising to the crater. In 1788, during a terrible eruption of Hecla, a prodigious stream of lava flowed from a lateral crevice; moving slowly down the mountain-side, it reached a distance of 50 miles in 42 days; it then branched into two main streams, the one running 40 miles, and the other 50 miles further towards the sea. Its depth varied from 600 to 1000 feet, and its greatest width was 15 miles. The amount of lava poured out into this stream would almost equal Mont Blanc in bulk.

The power which exhausts itself in the eruption of a volcano often shews itself by changes which it produces in the level of the country around. About a hundred years ago, a volcano appeared in the centre of the great table-land of Mexico, and raised an area of nearly four square miles 550 feet higher than it was before, covering it at the same time with conical hills of various heights, the highest of which is Jorulla, which is 1600 feet high. But sometimes a subsidence takes place. In 1772, a great part of the Papandayang, a mountain in Java, was swallowed up: the inhabitants of its declivities were suddenly alarmed by tremendous noises in the earth, and before they had time to retire, the mountain began to subside, and soon disappeared. The area thus sunk was 15 miles long and 6 broad.

A volcanic eruption is generally preceded by rumbling noises and slight movements in the earth; then fitful puffs of gases and steam are given off. These contain much sulphur; and some volcanoes give out such quantities of carbonic acid and other mephitic gases as to destroy the animals in the neighborhood. Sir William Hamilton picked up dead birds on Vesuvius during an eruption; in 1730, all the cattle in the island of Lancerota, one of the Canaries, were destroyed by these deleterious emanations. The Upas Valley in Java contains an extinct crater; and the certain death which overtakes every animal that penetrates the valley, is due to the noxious gases given out from it, and not to the *Antiaris*, which, though yielding a deadly poison, does not affect the atmosphere in which it grows. The eruption itself begins, perhaps, with the ejection of the finest dust, and that with such a force as to project it high into the atmosphere, where, taken up by air-currents, it is often carried to enormous distances. In 1945, the dust from Hecla was in ten hours thickly deposited on some of the Orkney and Shetland Islands; the ashes from Concepciona fell, in 1835, on the streets of Kingston, Jamaica, at a distance of 700 miles; and during the same eruption, the fine dust covered the ground at a distance of nearly 30 miles to the south of the volcano, to a depth of more than 10 feet, destroying the woods and dwellings, and enveloping thousands of quadrupeds and birds.

The flames seen issuing from the crater are usually the reflection of the glowing lava emitted from the crater, and illuminating the clouds of vapor, scoræ, and ashes.

Lava and scoræ are at last vomited forth. Sir William Hamilton says that, in 1779, the jets of liquid lava from Vesuvius, mixed with scoræ and stones, were thrown to a height of 10,000 feet, giving the appearance of a column of fire. The

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Volga

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Lava, however, generally issues from openings in the side of the mountain. It pours forth in a perfectly liquid state, bright and glowing with the splendor of the sun. At first, it flows rapidly; but as its surface becomes cooled and converted into slag, its velocity diminishes. It has to burst the indurated coating before it can continue its progress, and the liberated lava when it flows bears on its surface masses of scoriae, looking like the slag from an iron furnace.

The materials ejected from a volcano, though differing greatly in appearance, have the same mineral composition. The ash is merely the pumice in a very fine state of division, and the pumice also is only lava made vesicular from contact with air or water.

The theories propounded to account for volcanic action are either chemical or geological. Sir H. Davy suggested that if immense quantities of the metallic bases of the earths and alkalis were present in the interior of the earth, all the phenomena would be produced by their oxidation from contact with air or water. Although the distinguished author of this theory abandoned it, it has since been taken up and advocated by Daubeny and others. Bischof, assuming that the interior of the earth consists of a highly heated and fused mass, considers that the mechanical action of water, converted into steam by the great heat, would produce volcanic action. Both theorists seek support for their views from the fact, that the great majority of volcanoes are situated on or near the sea-coast. Geologists accepting also the doctrine of internal heat, and believing that at a depth variously estimated—by some as low as 10 miles, and by others as high as 25 miles—the rocks of the earth are in a state of fusion, explain volcanoes by considering them as connections established between the interior of the earth and the atmosphere; and Darwin, from observations made in all parts of the world, believes that volcanoes are chiefly, and, indeed, almost only found in those areas where subterranean motive-power has lately forced, or is now forcing upwards the crust of the earth, and are invariably absent in those where the surface has lately subsided or is still subsiding.

Volcanic action is limited to particular regions of the earth. In these regions, the active vents are distributed at intervals, and are generally arranged in a linear direction. The Pacific Ocean is bounded by an almost unbroken line of active volcanoes. Beginning in the New South Shetlands, where there is an active volcano in lat. 62° 55' s., we pass to Tierra del Fuego, and then on to the Andes, which are throughout their whole course volcanic, although the great centres of present action are confined to Chili, Peru, the neighborhood of Quito, Guatemala, and Mexico. The line is continued northwards by the burning mountains of North-western America, and the Aleutian Islands carry the chain across to Kamtschatka on the Asiatic side. Here turning southwards, the line may be traced through the Kurile Islands, Japan, Formosa, the Philippines, Moluccas, New Guinea, and the Solomon and New Hebrides groups to New Zealand. From Celebes a branch proceeds in a north-westerly direction through Java and Sumatra, to Barren Island in the Bay of Bengal; and even beyond this we find a region in Northern India subject to earthquakes, which may lead us, on the one hand, to the volcanic region in Tartary, or, on the other, through Asia Minor to the Greek Archipelago, Sicily, Naples, and on to the Canaries and Cape de Verdes. According to the geological theory, the lines thus traced over the globe would represent rising lands, where the crust is less strong, and so less liable to repress the expansive powers below. There are a number of isolated volcanoes also scattered over the surface of the earth; these are supposed to have opened a star-shaped communication with the interior. The most remarkable of these isolated volcanoes are Jan Meyen, in lat. 70° 49' n.; and those in Iceland in the north, and Mount Erebus in South Polarland, in lat. 77° 32' s.

VOLE (*Arvicola*), a genus of rodent quadrupeds, of a group which some naturalists constitute into a family (*Arvicolidae*), but which is more generally regarded as a tribe or sub-family of *Muridae* (q. v.). This group is characterized by a thicker and shorter form than that of the true rats and mice; an obtuse muzzle; ears of moderate size; a round and hairy tail, not so long as the body; the molar teeth with flat crowns, which present angular enamelled plates. These characters exhibit an approach to the Beaver family (*Castoridae*). The Lemmings (q. v.) belong to this group. The species are numerous, and widely distributed, being found in Europe, Asia, Africa, and North and South America. Some of them are completely terres-

trial in their habits, others are aquatic. Many are popularly called rats and mice, as the species of the genus *Arvicola*, which are found in Britain. In this genus, the teeth are only ten in number; two incisors and three molars in each jaw. One of the most common British species is the FIELD V. (*A. agrestis*), also known as the MEADOW MOUSE and SHORT-TAILED FIELD MOUSE. The whole length of the head and body is scarcely more than four inches, that of the tail rather more than an inch and a quarter. The Field V. has a large head, a very obtuse muzzle, ears just appearing above the fur, the thumb of the fore-feet rudimentary, and without a claw. The upper parts are reddish brown, the under parts ash-color, the feet and tail dusky. It burrows in the ground, or finds a retreat for itself in the excavations of some other animal, as of the mole. It chiefly inhabits low and damp situations, and dry seasons are very fatal to it. It produces from five to seven young at a birth. It is sometimes very injurious to plantations, by destroying the roots of trees and devouring their bark. Excessive numbers of this little animal were regarded in 1813 and 1814 as threatening the destruction of the Forest of Dean, and the new forest in Hampshire; and many trees were killed; but a remedy was found in digging pits into which the voles fell, and from which they could not escape. The same method has been successfully employed in some of the forests of Continental Europe. This species of V. is found in most parts of Europe, and in many parts of Asia. It is common in the Himalaya.—Another very common British species is the WATER V. (*A. amphibis*), popularly known as the WATER RAT, a much larger animal, the head and body being about 8½ inches in length, and the tail 4¾ inches. The head is thick and short, the muzzle very obtuse, the eyes small, the ears scarcely seen beyond the fur; the last joint only of the thumb of the fore-feet conspicuous beyond the skin. The fur is thick and shining, of a rich reddish brown mixed with gray above, yellowish gray beneath. Although the feet are not webbed, the Water V. swims extremely well, and not only at the surface of the water, but often under it. It burrows in the banks of streams, ditches, and ponds. Its food appears to consist chiefly of aquatic plants, although it objects to no kind of vegetable food, and has been known to store up potatoes in its burrow for winter. It has been supposed also to feed on worms, frogs, and small aquatic animals, and to be destructive to the spawn of fish; but this is very doubtful. This species is widely diffused over the continent of Europe. There is a black variety of it, common in some parts both of England and Scotland, which has been described as a distinct species (*A. atra*). Several species of V. are found in North America.

VOIGA, the most important river of Russia, and the longest in Europe, has its origin in a marshy plain among the Valdai Hills, in the government of Tver; lat. 57° n., long. 33° 10' e. From its source, which is 550 feet above ordinary sea-level, and 683 feet above the level of the Caspian Sea, into which it falls, the river flows south-east to Zubzov, then north-east past Tver and Kolozin to Mologa, where it turns east-south-east, and flows in that direction past Jaroslav, Kostroma, Nijni-Novgorod, and Kazan, 50 miles below which, on receiving the Kama, it turns south, passing Simbirsk, Stavropol, and Samara. Here its course again changes to south-west, and in this direction the river flows, until it reaches Tzaritzin, when it bends to the south-east, and reaches the Caspian Sea, which it enters by many mouths, and after a course of 2320 miles. The V. waters 9 governments—those of Tver, Jaroslav, Kostroma, Nijni-Novgorod, Kazan, Simbirsk, Samarkand, Astrakhan, and besides these, 12 other governments are watered by its tributaries. The course of the stream is generally divided into three parts—the upper part reaching from its source to its confluence with the Szekma, and, though presenting many hindrances to navigation, yet capable of being traversed from Tver to Rybinsk by craft of 1½ and 2 feet draught; the middle part, from Rybinsk in Jaroslav to Nijni-Novgorod, navigable for larger craft; and the lower V. from Nijni-Novgorod to Astrakhan—where it is about 90 feet deep—navigable for the largest vessels. Below Astrakhan, the V. is very much shallower—in some places only 1½ feet deep. At Tver, the breadth of the river is 730 feet; at Mologa, 2000 feet; at Nijni-Novgorod, 2000 feet, but sometimes in the spring 2½ miles broad; at Simbirsk, about a mile broad; between Samara and Syran, from 1 to 3 miles broad. Below Tzaritzin, at the confluence of the Sarpa, the river affords few facilities for navigation, and is remarkable for the number of branches into which it divides itself before it enters the Caspian Sea. The banks of the V., which are elevated in the upper and middle reaches, become much lower as the river approaches its embouchure. The chief

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ferries and commercial towns on the V. are: Rjev, Znbzov, Tver, Kollazin, Uglitch, Mologa, Ryhlusk (the great centre of the corn-trade), Jaroslav, Kostroma, Nijni-Novgorod, Kazan, Simbirsk, Samara, Tzaritzin, and Astrakhan. The system of water-communication established by the V. and its tributaries, is of the greatest importance to the commerce of Russia, connecting as it does the central districts of the country with the White Sea by means of the canal of the Prince of Würtemberg; with the Baltic by the three canal-systems of Tichvin, Vishni-Volotchek, and Muromsk; with the Black Sea by the Upa Canal, which connects the Oka and the Don; with the Caspian Sea by the great stream of the V. itself; and with Siberia by the rivers Kama and Tchussovain. The principal affluents on the right are the Oka (q. v.) and the Sura; on the left, the Tvertza, Mologa, Szeksua, and Kama (q. v.)

VOLHY'NIA, a frontier government of West Russia, bounded on the s.-w. by Galicia, and on the w. by Poland, from which it is separated by the river Bug. Area, 27,349 sq. m.; pop. (1870) 1,704,018, mostly Russians, Poles, Lithuanians, Jews, Germans, and Tartars. The surface in the north of the government is low; and plains and morasses, covered with forests, abound; in the south, there are hills, branches of the Carpathian Mountains, but which do not rise higher than 1230 feet. Almost all the rivers flow north, and join the Pripet, an affluent of the Dnieper; a few streams, however, flow west, and join the Bug, by means of which river timber is floated down from this river to Prussia. The soil is sandy or clayey; agriculture flourishes in the south, and corn is exported to Odessa, Galicia, Poland, and partly to Great Russia. Cattle-breeding has always been a prosperous branch of industry in V. until recently, but a fine breed of sheep are still reared, and the government possesses the finest studs in the empire—those of the Princes Sangou-eko and Tzartorsky. Of the woods, which form the principal riches of the north districts, fir is the chief. The forests abound in foxes, hares, and bears, and hunting is a favorite pastime. Many sugar-mills, cloth-factories, and distilleries are in operation, and the manufactures are increasing yearly. Corn, cattle, sheep, wool, cloth, linen, timber, honey, and wax are the principal articles of trade.

V. in early times belonged to the ancient Russians, but was conquered by the Lithuanians and Poles in 1320, and remained in their hands till its annexation to Russia in 1798.

VOLITION. See **WILL**.

VOLLEY, the simultaneous discharge of a number of small-arms. The same operation from cannon is called a **salvo**.

VOLNEY, Constantin François Chassebœuf, Comte de, was born at Craon, in Anjou, on the 3d of February 1757. He was the son of an advocate of good reputation. His family name was Chassebœuf, but on arriving at manhood he assumed the additional surname of Volney. He got his preliminary education at the colleges of Aneenis and Angers, and afterwards went through a protracted course of study at the university of Paris. His father wishing him to join his own profession, he spent some time in preparing for the bar; but he renounced law for medicine, which, however, he never practised. He had inherited a competency from his mother, and, soon after completing his studies, in the year 1783, he set out for Egypt, with the intention of travelling in Egypt and Syria. This expedition occupied him about four years. On his return to France in 1787, he published his celebrated "Travels in Syria and Egypt," which still contain the most trustworthy as well as one of the liveliest and most interesting accounts which have been published of the tribes with which he came in contact. This work at once procured him a great reputation. At first, there was a disposition to question the veracity of some of his descriptions; but their truthfulness was fully confirmed when the French became more familiar with the Egyptians and the Arabs through the expedition of 1798. The sagacity of the chief political conclusions to which his residence among these peoples had brought him, which in 1788 he embodied in a pamphlet—"Considerations on the War between the Turks and the Russians"—has also been shown by subsequent events. In 1790 he was elected to the *Etats Généraux*, as a member for his native district, and took a somewhat prominent part in the political discussions of the years which followed, shewing himself, as he has done in his works, a fast friend of the public liberties, a mocker at all systems of religion, and at the same time a fearless opponent of popular excesses. He was imprisoned for his outspoken-

ness in 1793, and was not liberated till after the downfall of Robespierre, in July of the following year.

In September 1794, V. published his "Ruins;" "Reflections upon the Revolutions of Empires," upon which, and upon his "Travels," his reputation chiefly rests. V. believed that political, like all other organisations, are subject to decay and destruction. The discussions contained in the "Ruins" cover almost all the radical questions in politics. Its principles are those of 1789. It vindicates the doctrine of the rights of man, establishes the duty of toleration in matters of opinion, and maintains, with perhaps too much of sarcasm and mockery, the human origin and the essential falsity of all religious systems. In the previous year, V. had published his "Natural Law," a catechism for a French "citizen," in which he treats morality as a physical and material science, to be studied upon the same methods as the other natural sciences, and having no object but the conservation and improvement of society. This work was afterwards republished under the title of the "Physical Principles of Morality."

Towards the close of 1794, he was appointed Professor of History in the short-lived Ecole Normale; and the brilliant discourses, not untinctured with paradox, which he delivered in this capacity, made a sensation in Paris even at that unsettled time. On the suppression of the Ecole Normale in 1796, he went to the United States, intending to spend the remainder of his days there; but circumstances made his residence there extremely disagreeable to him, and he returned to France in the spring of 1798. In his absence, he had been elected a member of the Institute; he was, soon after his return, admitted to the Academy; and henceforth his life, though not inactive, was prosperous and untroubled. He had early been acquainted with Bonaparte, and had been of service to him at the time when political circumstances had deprived him of employment; and Bonaparte, on becoming First Consul, desired to associate him with himself in the government as consul or as Minister of the Interior. V. refused both offices, but accepted a seat in the Senate. He protested against the establishment of the Empire, and resigned his seat in the Senate; but his resignation was declined; and during the existence of the Empire he formed one of the little band, sneered at by Napoleon as *idéologues*, who in the Senate attempted by their criticisms to restrain the arbitrary conduct of the emperor. Henceforth, however, his occupations were mostly literary. He published "Researches into Ancient History," several of the papers contained in which were written in the earlier part of his career; and also several linguistic works, in which he attempted to popularise, and, by means of a universal alphabet, to simplify the study of the eastern languages. He had accepted from Napoleon the title of Count, and the commandship of the Legion of Honor; and upon Napoleon's downfall he was among those who were called to the House of Peers by Louis XVIII. His latest work, published in 1819, was "The History of Samuel, the Inventor of the Sacredness of Kings." V. died on the 25th April 1820, shortly after completing his 68th year.

VOLO'GDA, an extensive government of Great Russia, bounded on the e. by the Ural Mountains, and on the n.-w. by the government of Archangel. Area, 151,600 sq. m.; pop. (1870) 1,008,089, chiefly Russians, but comprising also a few Finns,—by which race this territory was inhabited in early times. The districts in the east, adjoining the Ural Mountains, are traversed by branches of that chain, which rise to the height of from 3000 to 4000 feet. But by far the greater part of the government is occupied by marshy plains, covered with impenetrable forests. The soil is not fertile, except in the south-west districts, which are the most densely peopled, and produce corn sufficient for local consumption and the supply of the distilleries. In the middle districts, there are comparatively few inhabitants; cultivated land is rarely seen, and hemp is the only crop produced liberally. The wooded morasses of the north are inhabited only by Finnish tribes, engaged in hunting. The banks of the rivers are, as a rule, the only inhabited places. The principal rivers, fifteen of which are navigable, are the Northern Dvina, with its great upper waters, the Suchona, Jug, and Withegda; and the Petchora, with its affluents. Lakes are numerous. Salt-works, iron-works, and distilleries are in operation; and salt, iron, skins, tallow-candles, and cheese are exported; and corn and manufactured goods imported.

VOLOGDA, a city of Great Russia, in the south-west angle of the government of

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the same name, of which it is capital, stands on both banks of the river Vologda, 467 miles east of St Petersburg. It is said to have been founded in the 18th c. by settlers from Novgorod, to which principally it belonged down to the 15th c., when it was annexed to Moscow. In 1553, when England opened up a trade with Russia, through the port of Archangel, V. was the great entrepôt for goods deported north by the Northern Dvina; and even yet it exports to St Petersburg and Archangel various products of its own and neighboring governments, to a considerable amount. Nitro-gel and filigree work are manufactured. Political offenders are sometimes banished to Vologda. Pop. (1867) 17,859.

VOLSCI, an ancient Italian people, closely related to the Umbrians. See **UMBRIA**. Their territory was bounded on the w. by that of the Latini, on the n. they marched with the Æqui and Hernici, on the e. with the Samnites, and on the s. they had the sea. Along nearly the whole of their coast lay the Pontine Marshes, while, inland, their territory was somewhat mountainous. The V. were a brave and warlike people, who, frequently in alliance with the Æqui, were incessantly at war with the Romans for upwards of 200 years previous to 883 B. C., about which time they appear to have been finally subdued, their territory incorporated into Latium, and they themselves created Roman citizens. See **LATINI**. These wars were very harassing to the Romans, as they were often carried on not so much by the V. as a whole, as by different cities, each frequently on its own account. Some of the chief towns, and those which took a principal part in the wars, were Antinum, Vellitræ, Satricum, Privernum, Uluhrs, Suessa Pometia, Anxur, and Tarracina, and later, Forum Appii and Tres Tabernæ. The legend of Coriolanus (q. v.) is connected with the Volscian wars. See **ROME**, **TARQUINIUS SUPERBUS**, **ANTIUM**. From the time of their final subjugation, their history belongs to that of Rome (q. v.).

VOLSK, or **Volgsk**, a town of European Russia, in the government of Saratov, on the right bank of the Volga, 80 miles north-east of Saratov. Fat and skins are prepared and exported to St. Petersburg, and corn is exported in large quantities to Astrakhan and Rybinsk. The inhabitants are chiefly engaged in the culture of gardens and orchards, and the fruits grown are exported principally to Nijni-Novgorod. Pop. (1867) 26,858.

VOLTA, Alessandro, a celebrated Italian physicist, was born at Como, of a noble family, in 1745, and received an excellent education. In 1774 he was appointed Professor of Natural Philosophy at Pavia, and continued to discharge the duties of this chair till 1804, when he retired to his native town, to spend the rest of his days. V., while but a youth, had exhibited considerable taste for letters, and had even written two poems, one in Italian, and the other in Latin; but as he grew older, he abandoned all such pursuits, and devoted himself exclusively to the sciences, especially those connected with electricity. At intervals between 1777 and 1783, he visited Switzerland, Tuscany, Germany, Holland, France, and England, making the acquaintance of the most eminent philosophers of these countries; and on his return is said to have introduced the culture of the potato into Lombardy. In 1796, he was one of a deputation sent to solicit the forbearance of Napoleon; and was received with distinction by the French general, who afterwards invited him to Paris, to exhibit, to the members of the Institute, the action of the "pile" (see **GALVANISM**), which he had invented, enrolled him in the Legion of Honor, and conferred on him the order of the Iron Crown, with the titles of Count and Senator of the Kingdom of Italy. He was also elected (1801) a Foreign Associate of the French Institute, ten years after he had been made a Fellow of the Royal Society of London. He died at Como, March 5, 1826. V.'s contributions to the science of electricity are of great importance, the chief of them being his theory, in opposition to the "animal-electricity" doctrine of Galvani, that the electric power resides in the metals; although, in turn, he fell into the error of supposing that the chemical action of the different kinds of metal on each other was only incidental. He also invented an electric battery, consisting of a series of cups arranged in a circle, each cup containing a saline solution, in which were immersed, edgewise, two plates, one of zinc and the other of silver, the zinc plate in one cup being connected with the silver one in the next by means of a wire. This battery was, however, soon after superseded by his "pile." He also invented, in 1775, the *Electrophorus* (q. v.); in 1793, the *electrical Condenser* (q. v.), employing with it an electrometer (see **ELECTRICITY**), "a

which two straws were employed instead of the gold-leaf strips now in use; and also (1777) the hydrogen-lamp, and the electrical pistol. Most of his important discoveries were communicated by him directly to the Royal Society in the form of *Memoirs*, which were published in the "Philosophical Transactions" (1782, 1783, 1800); and the Copley Medal was awarded to him in 1794.—A collection of V.'s works was published in 1816 at Florence, under the title of "*Collezione delle Opere, &c.*" in 5 vols. 8vo.

VOLTAIRE (FRANÇOIS-MARIE AROUET, his true name)—one of the most famous French writers—was born, according to his own account, as given in later life, on 20th February, 1694, at Chateau, near Sceaux. The register of his baptism, however, assigns Paris as the place of his birth, and dates it 21st November of that year. As to which of these statements may be really the correct one, his biographers are not yet fully agreed. His father was François Arouet, a notary of the Châtelet, ultimately Treasurer of the Chamber of Accounts, his mother, Marguerite D'Aumar, of a noble family of Poitou. Of two sons born to them, François was the younger. He received his education at the College of Louis le Grand in Paris; and on its completion, he was set to study law by his father. But he found this pursuit too disgusting and speedily quitted it for the career of a man of letters. By his godfather, the Abbé de Châteauneuf, who was very intimate with her, he was introduced to the celebrated Ninon de l'Enclos, and through her to the best French society of the period. In these wicked and witty circles, being himself deficient in neither wickedness nor wit, the young man prospered extremely; and so perfectly unexceptionable was the company in which he found himself, that one day he could exclaim, looking round the table with complacency: "Are we all, then, either princes or poets?" His father, however, deeply disapproving of the life he led as immoral, and probably not inexpensive, had him sent to Holland with an embassy. Here he became involved in a love-affair of the more respectable kind, which ended, not in marriage, as he seems to have proposed, but in his being sent back to Paris, to resume his gay career. Shortly, it suffered another interruption: on suspicion (unfounded) of his being the author of some satirical verses, reflecting on the government of Louis XIV., then just dead, he was sent to the Bastille (May 17, 1717), where he remained upwards of a year. This time of imprisonment he improved by sketching his famous poem, afterwards published as the "*Henriade*," and by finishing his tragedy, "*Œdipe*," which was produced on the 18th November, 1718, and had so great a success with the public, as not only to delight the author, but somewhat to mollify his old parent, who began to surmise that the despised "poetry" of his offspring was not unlikely to come to something. The same success did not, however, attend his next ventures: his tragedy, "*Artemite*," produced in 1720, was hissed off the stage; and his "*Mariane*," which followed in 1724, fared little better. Meantime, he had again visited Holland, making, on the way, the acquaintance of Jean Baptiste Rousseau, a poet of some importance, then living at Brussels. The two geniuses met as friends, only to part as irreconcilable enemies. Their quarrel is said to have originated in a characteristic *mot* of V., who, his critical opinion being asked on an "*Ode à la Postérité*," which Rousseau read to him, had the candor to reply thus: "Mon ami, voilà une lettre qui n'arrivera jamais à son adresse." In the summer of 1725 occurred a misadventure, which, for V., had important consequences. At the dinner-table of the Duke de Sully, he resented with spirit an affront put upon him by the Chevalier de Rohan, who, worsted in the war of wit, as most men were likely to find themselves with V., avenged himself some days after by having his adversary thrashed in public by footmen. Subjected to so gross an outrage, V. retired for a time into private life, assiduously perfected himself in the small-sword exercise, and then courteously entreated the Chevalier to a meeting in the *duello*. The Chevalier, as it proved, had small stomach for the encounter; having immortalised himself sufficiently by his insult to the poet, he considered it unnecessary to aspire to the further immortality of being killed by him. Under superficial pretences of accepting the challenge, his practical answer to it came in the form of a *lettre de cachet*, which consigned V. once more to the Bastille. His imprisonment was not on this occasion a long one; but it was only under sentence of exile that he was permitted to issue from durance; and on doing so, he betook himself to England. Some little time previous, the young Arouet had assumed the name of Voltaire, destined to become so famous. As to the origin of this name, considerable perplexity has existed;

but there can scarce be a doubt of the correctness of the conjecture thrown out by Mr. Carlyle, in the second volume of his "Frederick" that it is simply an anagram of Arouet L. J. (*la jeune*).

Arriving in England in 1726, V. remained there upwards of two years. Of this episode of his life, we have only the most meagre account. It is certain, in a general way, that he had the *entrées* to the best English society; he knew Bolingbroke, Pope, and, we need not doubt, many others of the intellectually distinguished. Of his visit to the famous Mr. Congreve, and the little skirmish of wit between them, we have express record. It was a whim of Congreve to affect dislike of his fame as an author, as to a certain extent a disparagement of his claims as a person of quality. On his signifying to V. that it was simply as this last he desired that his friends should regard him, he was answered to the effect, that had he been nothing more than the elegant gentleman he considered himself, M. de V. would scarce have thought it worth while to solicit the honor of his acquaintance. To V., his residence in England was fruitful of new knowledge and ideas; in the school of the English Deists, Bolingbroke, Collins, Tindal, Wollaston, &c., he found speculations much to his mind; the philosophies of Newton and Locke he studied diligently; and in his subsequent dramas there may be traced a distinct influence from Shakespeare, whom, however, he has expressly vilified, as a barbarous monster of a writer, intolerable to any reader with the least tincture of orthodox French *goût* in him. Not the less the distinction remains with V. of having been the first Frenchman to recognise in some decisive, if grudging and inadequate way, the essential superiority of our great national poet. The intellectual debt thus indicated was not the only one which V. owed to England. Whilst resident there, he published in a revised form his epic poem, the "Henriade," a surreptitious edition of which had already appeared in France. The work was dedicated in English to Queen Caroline; the subscription for it was headed by her and other members of the royal family; the rank and fashion of the country could not but follow the illustrious example set them; and for result, V. could convey into his pocket a comfortable sum (stated so high as £5000), which became the basis of his future fortune. From the time of his return to Paris in 1728, he had always on hand some money speculation: investments in corn, bacon, or whatever a pretty penny could be turned by, with now and then a far army-contract, which a friend might have interest to secure for him; and so shrewd in his finance was he, that, owing but little to his books, which, despite of their immense popularity, were never a great source of profit to him, his income at his death is ascertained to have netted some £7000 per annum, a revenue then to be styled princely. Of his literary labors, from this time forward unremitting, the sum of which remains in something like ninety volumes, no detailed account can here be attempted. His was truly a universal genius; he wrote literally everything—histories, dramas, poems, disquisitions, literary, philosophical, and scientific; novels, for the most part with some doctrinal purpose, of which his famous, "Candide, or the Optimist," may stand as the type; his literary correspondence was on an unexampled scale; and he was seldom without some fierce polemic on hand, in which his adversaries had to writhe for the amusement of the public, under the scourge of his envenomed wit.

In the gay society of Paris, he became acquainted with a certain Madame du Châtelet, who was living apart from her husband, the Marquis, though still on polite terms with him. She was *assez spirituelle*; a most fascinating woman of the world, and in the matter of intellectual accomplishment, the bluest wonder of the period; most especially she was deep in mathematics, and had mastered the mysteries of Newton's "Principia." As himself an admirer of Newton, V. could not but be charmed to meet him thus surprisingly put into petticoats; nor could a woman so intellectual as Madame fall, in her turn, to appreciate the tender attentions of such a genius as M. de Voltaire. Their intimacy became extreme; and finally, in 1733—the husband of the lady behaving like a philosopher and man of fashion of the time, and continuing now and then to visit them—they went off to prosecute it undisturbed at Cirey, an old château in Champagne, the property of M. du Châtelet. Here, for the most part, they diligently studied Newton together for the next fifteen years. The arrangement seems to have been on the whole a not unhappy one; but towards the close, it became complicated for M. de V. by the advent of another lover, in the person of a Monsieur de Saint-Lambert. It is not conjectured that this

gentleman knew anything of Newton, or was at all such a genius as V.; but it is certain that, on some other ground unexplained, he found favor with Madame du Châtelet. The philosophy which the husband had been good enough to practice in favor of V., was now required of himself; and after a little nuptial-santness he was able to reconcile himself to the inevitable. This curious triangular love-affair—or *square*, if we include the husband—was not, however, of very long duration. In 1748, Madame du Châtelet died in child-bed. V. was overcome with grief; and the touching reproach which, in the first agony of bereavement, he addressed to the culpable M. de Saint-Lambert, a fortunate chance has preserved for us: “Eh! mon Dieu! Monsieur, de quoi vous aviez-vous de lui faire un enfant.” This, which is now so shocking, illustrates strikingly the morals of a period in which it seemed entirely *comme il faut*.

To dissipate the sense of loneliness which overpowered him in the loss of his “divine Emilie,” as he was wont, in his more lyrical moments, to call her, V. once more betook himself to Paris, whence, in 1750, he proceeded to Berlin, on the invitation of the young king of Prussia, Frederick, since known as “the Great.” Between him and V. much correspondence had already passed; and they seem to have entertained for each other a sincere admiration and regard. When they came together, however, it was found, as so often in such cases before and since, that it is not in the matter of mountains only that “distance lends enchantment to the view.” They quarrelled bitterly, and parted; V., at his exit from the country, being subjected to indignities which he found it hard to forgive. Into the details of the quarrel we need not enter. When we say that the king was a poet at once most profuse and most execrable; and that the main function of V.—himself a poet—was to criticise and correct his verses, it should almost seem that we indicate, without going further, a sufficient *origo mali*. V. detested the king’s verses; the king could hardly have been even the very bad poet he was, without heartily detesting V.’s criticism and corrections. Is it marvellous that in no long time they got heartily to detest each other? A reconciliation was afterwards effected, and their literary correspondence was resumed under the old forms of friendliness; but meantime V. had avenged himself in the amusing but most scandalous chronicle, entitled “*Vie Privée du Roi de Prusse*,” which was found at his death among his papers, and published, as there is pretty good reason to suppose, the wicked wit meant it should be.

After some years of a somewhat unsettled kind, V., in 1758, established himself along with his niece, Madame Denis, at Ferney in Switzerland, where, with little exception, the last 20 years of his life were passed. During this period, some generous traits of character are recorded of him. Thus, he rescued from extreme want a grand-niece of Corneille, the great dramatist, had her carefully educated under his own eye at Ferney, and made over to her the proceeds of an annotated edition of her ancestor’s works, which he issued for her express benefit. His noble exertions in behalf of the Calas family, the victims of a shameful persecution, are also well known. In 1778, he was induced by his niece to revisit Paris. By the Parisians, the poet, now in his 84th year, was received with a perfect tumult of enthusiasm, the excitement connected with which is thought to have hastened his death, which took place on the 30th of May of that year.

With the doubtful exception of Rousseau (Jean Jacques), who in his character of *vates* and enthusiast, was perhaps even more deeply influential, V. is by far the most memorable of the band of celebrated writers whose crusade against established opinions was preparing the grand *culbute* of the French Revolution. As every one knows, it was mainly in the field of religious polemic that his destructive energies were exerted. It is common to stigmatize him as an Atheist, but this is simply to exhibit ignorance. Discarding revelation, he steadily upheld the truths of natural religion, and was, in fact, a Deist pretty much of the English type. As such, he was not a little despised by the more “advanced” minds of the period, Diderot and the like, who considered belief in a God clear evidence of intellectual infirmity. His favorite weapon was ridicule, and there was never, perhaps, a greater master of it. In a particular form of polished mockery, V. remains almost without a rival. His prose is the perfection of French style; it is admirable in grace, clearness, vivacity, and alive like a sparkling wine with the particular quality of *esprit* peculiar to the people and the language. As a dramatist, V. takes rank as a worthy third with his two great predecessors Corneille and Racine. His most famous poems are the

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"Henriade," before mentioned, the one epic of the language, and "La Pucelle," which is, perhaps, more properly to be styled infamous, such is the profanity and indecency with which the writer has willfully defiled the heroic story of the Maid of Orleans. In the historical works of V., with the utmost lucidity of method, there are traces of a more philosophical treatment than had previously been applied to such subjects. For its narrative charm, his little historiette, "Charles Douze," familiar to every schoolboy, is in its kind a perfect model. In English, biographical works on V. are very few in number. Of his earlier life, a most racy and amusing sketch will be found in the second volume of Mr. Carlyle's "Frederick the Great;" and his relations with Frederick are of course in that work treated of in full, with the writer's characteristic humor and insight. As a critical estimate at once of the man and of the writer, nothing better can anywhere be found than Mr. Carlyle's earlier Essay.

In 1866, the first volume of a "Life and Times of François-Marie Aronet, calling himself Voltaire," by Francis Espinasse, was published by Chapin and Hall; but this work, which promised to ably supply a desideratum, has been left unfinished. See also "Voltaire," by David Friedrich Strauss (1870); "Voltaire," by John Morley (London, 1873); and "Voltaire et la Société du XVIII^e Siècle," by T. G. Desnoiresterres (8 vols. 1855-1876).

VOLTE'RRÀ, a town of Central Italy, in the province of Pisa, stands on a tableland at the height of nearly 2000 feet above sea-level, 30 miles south-east of Leghorn. It is surrounded by cyclopean walls, which are in a better state of preservation than any structures of the same kind in Italy. The gate called *l'Arco*, and the remains of baths and of an amphitheatre, are interesting vestiges of antiquity; the cathedral, municipal palace, and *Pretorio*, are monuments of the middle ages; and the *Maatio*, a prison, is a modern edifice. V. contains a college, numerous schools, and a library of 120,000 vols. Wine, oil, corn, and mulberry trees are grown in the lands belonging to the town, which also possesses considerable mineral wealth. Pop. 6000.

V., the ancient *Volaterræ*, was one of the most powerful and important of all the Etruscan cities, and came into the possession of Rome 474 B.C.; after the fall of the Empire, it suffered much from the invasion of barbarians.

VOLTIGEURS, picked companies of irregular riflemen in the French regiments. They are selected for courage, great activity, and small stature. It is their privilege to lead the attack.

VO'LTÌ SU'BITO (Ital. turn quickly), in Music, an indication placed at the foot of a page, to signify that the page ought to be turned without delay.

VO'LTRI, a town of Northern Italy, in the province of Genoa, and $9\frac{1}{2}$ miles west of the city of that name, on the Gulf of Genoa. Its churches are richly adorned; it contains many fine villas, and manufactures paper extensively. Near it are the sulphureous springs and baths of Aqua Santa, very efficacious in cases of cutaneous disease. Pop. 6000.

VOLUME'TRIC ANALYSIS, in Chemistry, consists in submitting the substance to be estimated to certain characteristic reactions, the chemist employing for such reactions liquids of known strength, and from the quantity of liquid employed to induce the reaction, determining the weight of the substance to be estimated by means of the laws of equivalence. The idea of this method first suggested itself to Gay-Lussac in considering how most readily to determine the amount of silver in an alloy of that metal and copper; but the method itself did not come into general use till within the last thirty years. The liquid reagents of known strength are called *standard solutions*; and the amount employed may be estimated either by weight or by volume, but the latter being the easiest of application, is universally employed; and hence this method of analysis, based on the use of standard solutions, is called *volumetric analysis*. In order that a reaction may be applicable in volumetric analysis, it must satisfy the two following conditions: (1) It must not occupy much time; and (2) the termination of the reaction must be easily recognized and unmistakable to the eye. The necessity that these conditions should be fulfilled, very much limits the number of volumetric processes. In addition to the ordinary chemical apparatus, this kind of analysis requires graduated glass vessels of different kinds

for the measurement of the standard solutions. Of these, the most essential are: (1) *Pipettes*, which are glass vessels, intended for the delivery of the standard solution. One is provided with a single mark upon the neck, while the other is divided and graduated through its whole length, the division being always made into cubic centimètres (c. c.), according to French scale; (2) *Flasks* graduated for the contents in various sizes from one-tenth of a litre to five litres, and used for the preparation of standard solutions; (3) *Burettes*, or graduated tubes for measuring the liquids used in an analysis. The burette was invented by Gay-Lussac; but since his time, various modifications have been proposed, the best of which, for general purposes, is that which is known as Mohr's Burette. Its lower part is attached to an India-rubber tube and spring-clamp or clip (*Quetsch-Hahn*). Its principal advantages over other forms of the instrument are, that its constant upright position enables the operator at once to read off the number of degrees of standard (or test) solution used for any analysis, while the quantity of fluid to be delivered can be most accurately regulated by the pressure of the thumb and finger on the clamp; moreover, as it is not held in the hand, no error is likely to arise in the measurement from the heat of the operator's hand. The greatest drawback to it is that it cannot be used for those test-solutions which decompose India-rubber.

The *standard solutions*, known also as *test* or *titrated solutions* (from the French word *titre*, which signifies the standard of a coin), may be divided into (1) such as are immediately prepared by weighing a substance of known composition, dissolving it, and diluting it to the required volume; and (2) such as are prepared by approximate mixture and subsequent exact analysis. The preparation of the first kind requires no description; for the preparation of the second kind, we must refer to the article "Analysis, Volumetric," in Watts's "Dictionary of Chemistry," vol. i. p. 259, where the method is fully explained, and as an example, the preparation of a standard solution of sulphuric acid containing 4 grammes of hydrated sulphuric acid in 1 litre is given. It is obviously essential that the greatest care must be taken both with respect to the graduation of the measuring instruments and the strength and purity of the standard solutions, which must be protected from evaporation and other hurtful influences by being kept in bottles of 1 or 2 litres' capacity, provided with well-ground stoppers.

Volumetric methods are usually classified as follows, according to the principles on which they are based—(1.) *Analysis by saturation*, when the quantity of a base or an acid is measured by the quantity of acid or base which is required for exact saturation—a point to be determined by test-papers, tincture of litmus, &c. (2.) *Analysis by oxidation and reduction*, when the quantity of the substance to be determined is found by the quantity of chlorine, bromine, iodine, or oxygen to which it is equivalent (regarded as oxidant), or by the quantity of chlorine, bromine, iodine, or oxygen which it requires to pass from a lower to a higher stage of oxidation. The chief oxidising agents are permanganate of potash and bichromate of potash; while the reducing agents chiefly used are protoxide of iron and hyposulphite of soda. (3.) *Analysis by precipitation*, when the determination of a substance is effected by precipitating it in some insoluble and definite combination. Our limited space does not admit of our giving an example of more than one of these forms of analysis, and from its historic interest we shall select the last, in its application to the determination of silver. We shall borrow Mr. Sutton's account of this process. "Suppose," he observes, "that it is desirable to know the quantity of pure silver contained in a shilling. The coin is first dissolved in nitric acid, by which means a bluish solution containing silver, copper and probably other metals, is obtained. It is a known fact that chlorine combines with silver in the presence of other metals to form chloride of silver, which is insoluble in nitric acid. The proportions in which the combination takes place are 35.5 of chlorine to every 108 of silver; consequently, if a standard solution of pure chloride of sodium is prepared by dissolving 55.5 grains of the salt—i. e., 1 eq. sodium (=23) plus 1 eq. chlorine (=35.5) or 1 eq. chloride of sodium—in so much distilled water as will exactly make up 1000 grains by measure, every single grain of this solution will combine with 0.0108 of a grain of pure silver to form chloride of silver, which precipitates to the bottom of the vessel in which the mixture is made. In the process of adding the salt solution to the silver, drop by drop, a point is at last reached

when the precipitate ceases to form. Here the process must stop. On looking carefully at the graduated vessel from which the standard solution has been used, the operator sees at once the number of grains that have been necessary to produce the complete decomposition. For example, suppose the quantity used was 520 grains; all that is necessary to be done is to multiply 0.0108 grains by 520, which shows the amount of pure silver present to be 56.16 grains." By volumetric as compared with ordinary analysis, a large amount of time, labor, and therefore of expense, is saved; at the loss, however, often of due accuracy, unless the greatest care be taken that the standard solutions are of due strength, and the instruments accurately graduated. An analysis can thus be completed in a quarter of an hour, that would formerly have occupied a day or more. Independently of its application to pure chemistry, it facilitates to a great extent the chemical analysis of urine (on which subject see the English translation of Neubauer and Vogel "On the Urine," published by the New Sycl. Soc.), of waters (on which see Parkes "On Hygiene"), of manures, soils, &c.; and its processes have been freely introduced in the British Pharmacopœia. The standard book on this subject is that of Mohr, a German chemist; the English reader may consult the text-books of Scott of Dublin, and Sutton of Norwich, and various Memoirs in the "Chemical News."

VOLUNTARY CONVEYANCE is, in Bankruptcy and other proceedings, a conveyance which is made without any legal consideration, either of money or of marriage; and in competition with creditors having deeds made for consideration, is often deemed fraudulent, and is generally postponed or set aside altogether.

VOLUNTARISM, the principles or system of polity distinctive of those who advocate the separation of church and state; the cessation of state endowments and state grants for religious purposes, and, in general, of all interference, patronage, or exercise of authority on the part of the civil power in the religious and ecclesiastical affairs of the subject. The terms Voluntaryism and Voluntary have been in use since the date of the keen discussions regarding civil establishments of religion—commonly called the "Voluntary Controversy"—which sprung up in the second decade of this century between churchmen and dissenters, in Scotland; and they serve to suggest, not inappositely, the fundamental conception which underlies the creed of religious dissent, that all true worship, or acceptable service in religion, must be the free expression of individual minds, and that, therefore, religion ought to be left by civil society to mould itself spontaneously according to its own institutions and spiritual nature, without violence to individual freedom from any interposition of secular authority or compulsory influence. Voluntaryism seeks to define more accurately the limits of civil power by defining more adequately than preceding theories had done the latitude due to the movements of religion. Assigning the magistrate his proper sphere, it is equally careful to assign the church and the individual their appropriate spheres of responsibility and duty in reference to religion, within which they may work unchecked, in full harmony with all the claims of civil order. Voluntaryism may be regarded as the formula of advanced Protestantism, the corrected doctrine of church and state, which the failure of the experiment of national churches has forced on public thought. It is a protest in modern language against the encroachment of the temporal power, whether under the name of magistrate, nation, or political majority, on the rights and liberties of individual conscience. Voluntaryism has sometimes been erroneously considered the offspring of theological neutrality. On the contrary, its leading advocates base it on the expressed law of Christ respecting the constitution, administration, support, and extension of the church, as well as on the rights of conscience, the nature of civil government, and considerations of general equity and policy. In its most extensive sense, Voluntaryism embraces the whole question of the province of the magistrate in reference to religion and the church. Voluntaryists admit that magistrates as well as other men, being under law to God, ought so to execute the proper duties of their office that all shall be done in consistency with the paramount claims of morality and religion. At the same time, the nature and design of civil government excludes their authority from the domain of religion and conscience, and confines it to the secular concerns of individuals and of society. Magistrates, like other men, are under obligation to seek and to follow the highest available light and guidance in duty; but it is not therefore allowed them

to convert the rules of the Divine Word, which are addressed exclusively to the individual conscience, into laws for civil society. God alone being lord of the conscience, such laws only—though revealed in His Word—may be adopted and enforced in civil society as no requisite for its outward preservation, peace, and good order, and for the advancement of those secular interests which are the proper care of its rulers. While, therefore, magistrates, no less than other men—and for reasons common to all favored with the Gospel—ought, as individuals, to embrace and profess the Christian religion, and to employ wisely and justly the influence arising from their circumstances and station, it is no part of their political or official duty, or of the homage required of them by Christ, to emit, adopt, prescribe, or enforce a confession of faith; neither is it within their province to aim at establishing or propagating Christianity by the civil arm, to provide for, endow, or subsidize its teachers either in churches or schools; but it is their duty impartially to protect all their subjects, of whatever creed, in the enjoyment of full religious liberty, so long as their manner of exercising this civil right does not infringe on the equal rights of others. On this ground, and with such qualification, it is their duty to abstain from all interference with the jurisdiction and economy of the church—not excepting the matter of its support—which being regulated, as Voluntaryists believe, by special ordinances of Jesus Christ, its Head, it is an invasion of His prerogatives, and a frustration of His law for its support and extension, to place, or suffer to be placed, on the footing of a civil establishment. The doctrine regarding the support of religion has always been an important article in the Voluntary creed, and, in a restricted sense, Voluntaryism has been popularly defined by this doctrine. Negatively, the duty of providing for the support of Christian institutions does not lie with the magistrate or nation. The giving of property for the support of the gospel has been elevated by Voluntaryism from the position of an almost eleemosynary and political custom, to the rank of a systematic obligation and a financial law of the church. It is recognised as an act of religion, the duty and privilege of all Christians; and as each man is a steward of his silver or gold, responsible to none but its great Owner for his disposal of it in religious matters, the magistrate can possess no right to demand from him any portion for religious uses, or to apply to these uses the proceeds of taxation imposed for general ends. Civil society being promiscuous and variable in its constituents, a fixed arrangement for the endowment of religious bodies out of the public funds, is a fixed usurpation—as a system of occasional grants is an occasional usurpation—upon the liberty and property of all who dissent. The existence of an absolute unanimity among the subjects—even were it possible, as it would be otherwise, to ascertain and secure it from time to time—however it might remove for the moment from any minds the feeling of political grievance incident to such arrangements, could neither justify them as a policy, nor alter their character as an interference with religion in its economics. In its broad aspect, as an overstepping of the sphere of magistracy, all who restrict the magistrate, on whatever specific grounds, to secular affairs, must deem such interference objectionable; and Christian Voluntaryists would reasonably ask, why legal machinery should be employed to gather the offerings which, in the state of public sentiment supposed, must be flowing unforced through their natural channels? and in particular, whether, if Christ has not appointed the magistrate to “tithe and toll” for his church, society can presume to assign him a work beyond his province? There is a manifest division of duties dictated alike by reason and revelation; and Voluntaryism claims the results of experience as proof of the entire want of adaptation in the compulsory or magisterial power to deal with the support of a living religion. To burden the rent-roll, increase the assessments, distrain the goods and chattels of citizens, or even to preserve the forms of legal exaction for such a purpose, are measures which it is hard to believe either politic, scriptural, or just. The pecuniary supplies required for religious objects are to be secured, according to Voluntaryism, solely through the operation of moral influences and sacred motives. Truth, as well as error, must be left to provide for itself. The responsibility and privilege of providing for the support of Christianity having been attached by Christ to His church, it is further His law that its institutions shall be maintained and extended by the voluntary liberality of its friends. A primary obligation rests on those enjoying the services of a pastor to provide according to their ability for his maintenance, on the apostolic principle—

"Let him that is taught in the word communicate to him that teacheth in all good things;" while, on the equally apostolic principles, that the laborer is worthy of his hire, and that the strong should aid the weak, a mutual and collective responsibility remains with the general membership, to supply each other's ecclesiastical necessities, and to unite in measures that may provide an adequate remuneration to the pastors or other ministers of the church. Civil establishments of religion, together with all forms of state endowments and grants for religious purposes, are thus condemned by Voluntaries as human expedients, adverse to Christian development and the working of the law of self-support, which alone draws forth the resources, and educates the consciences and habits of the people. Inadmissible, as introducing the compulsory element into the free and delicate movements of Christian society, and intruding magistracy into a sphere which the history of all struggles for the higher liberty teaches must be preserved to the individual and the church, these institutions tend to foster political dependence and class-feeling among the recipient bodies, and prevent those relations of honorable trust and responsibility which best unite pastors and people. These views express what may be called ecclesiastical Voluntarism. On the question of education, various shades of opinion exist among Voluntaries. All are agreed that the religious education of the young belongs to the parent and the church, and is not to be provided or superintended by the state. How to secure this principle in connection with a system of national schools or government grants for education, continues to be the problem of Voluntaries. Some seek the solution in a plan of local boards representing the parentage and community, who shall manage the schools, and decide the character of the teaching; and of these, some advocate separation of the hours for religious and secular lessons. Others, who think that while by these methods state superintendence may be avoided, state aid is yet directly or indirectly received for religious instruction, would accept a system which provided simply for schooling in secular or common branches. Those known as Voluntary educationists reject the idea of any national system, some on account of the religious difficulty, and others on grounds connected with the philosophy of education and the theory of government. Voluntary educationists would leave the education of the poor to be secured by the operation of those influences which originate and sustain other necessary and benevolent measures. The education of the children of classes not necessitous they expect to flow from private enterprise and free association. Voluntaries consistently object to grants to denominational schools dependent on the condition of teaching religion, to grants to ragged schools and all semi-religious institutions, as well as the appointment and payment by the state of chaplains for prisons, the army, &c. In reference to the Sabbath, holding the sacred character of the day, some Voluntaries appear to admit that the magistrate is both entitled and bound not only to make it a *diei non* in his own department, but also to prohibit labor and amusement throughout the nation. Others, equally holding the morality of the day, with more regard to strict theory, deny him the power of inflicting pains and penalties, however mild, in a matter radically religious, at the same time that they assert the obligation of the state to secure all its members due protection and facility in the practice of their worship, and to make such laws for this end as may be fit, in view of prevailing religious observances. Regarding national fasts and thanksgivings, most Voluntaries hold that the style of authority in which royal proclamations appointing these have usually been expressed is objectionable, as assuming a right to prescribe the topics and language of devotion, and to regulate its seasons, and insist that the language of invitation should be substituted for that of command. Some, while ready to comply with an invitation of the sovereign to join in an offering of prayer on occasions they judge suitable, do not allow that it forms any part of magisterial duty to issue such appeals, or that the royal act imparts a national character to the service. Ordinary political acts become national when done by the proper national organs; but no religious acts can acquire a national character except they are participated by the body of the people. When this is the case, the exercise is national, though not evoked by the call of the chief of the state, and it is not made more national by that call. The advantage of simultaneousness and unity is attainable on the widest scale by the natural concert of churches apart from royal initiative, which, if it may be followed when right, need not be waited for as indispensable to true national worship. On the question of

marriage, Voluntaryism, recognizing its character as a civil transaction, demands that all religious parties stand on the same level in regard to it. Withholding legal sanction from all immoral connections, and punishing breaches of the lawful contract, magistrates are not warranted to visit with penalties any mere departure from the standard prescribed to Christian conscience, or embodied in ecclesiastical law. Political Voluntaryism, as it is sometimes called, is simply Voluntaryism expressed in the language of the politician—the doctrine of the entire religious equality of all citizens in the eye of law, stated and defended without reference to specific religious opinions, and in the way of appeal to principles generally received.

VOLUNTEERS—the great defensive citizen-force of Great Britain, in some degree corresponding to the National Guard of continental states. It is essentially self-supporting, and wholly unpaid; although government arms the men, and contributes a certain sum towards the corporate expenditure. The oldest volunteer corps is the "Honorable Artillery Company" of the city of London, which dates from the reign of Henry VII.; although still called artillery, it comprises artillery, cavalry, and infantry, and is probably the oldest armed body in Europe. When the country was in dread of invasion by Bonaparte, almost the whole available male population flew to arms as volunteers, and in 1803 they mustered 463,184 effectives. About this time, George III. reviewed 150,000 volunteers. The force gradually diminished, when the immediate danger ceased; and before the war closed, they were replaced by a new force called the "local militia," which was supposed to be more thoroughly amenable to government control. As early as 1857, two small volunteer corps, the 1st Devon and the Victoria Rifles, had sprung into existence; but in 1859, the whole nation seemed to awake to a sense of insecurity, with a comparatively small army, half of which was abroad, amid the enormous armaments of neighboring states. In a few months, 150,000 men had organised themselves into companies; and in the following year, government, which had at first shewn no favor to the movement, gave it a helping hand by combining the companies into battalions, by appointing paid adjutants and drill instructors, and by the establishment of a staff of inspectors under the control of an Inspector-general of Volunteers. The volunteers numbered, in 1876-1877, 268,750 effectives, in a high state of training, and capable of performing in a very satisfactory manner all the simpler military manœuvres. They are divided into a small number of Light Horse, Mounted Rifles, and Engineers, a force of 30,000 Artillery, and quite an army of about 123,000 Riflemen. Where 60 men can be got together, a company of volunteers may be formed, which is entitled to a captain and two lieutenants or sub-lieutenants for its officers. If a place is populous enough, and sufficiently zealous in the cause, to produce a corps of two companies, the senior officer becomes "captain commandant." Four companies make a major's command. Six are sufficient to constitute a battalion, for which government provides an adjutant, hitherto an old military officer, but in future an army captain, who receives 10*s.* a day besides his forage. When there are a number of detached companies in the different villages of a district, they are grouped into an administrative battalion (or brigade for detached batteries of artillery), with an adjutant, and with qualified field-officers. England and Scotland are further divided into military districts, each commanded by a general officer, and commands and inspects all forces of whatever kind within his district, his constant endeavor being to keep the corps in his district up to the standard of efficiency. Every company may have an honorary assistant-surgeon; but a corps of two companies is entitled to an assistant-surgeon; of four companies, to a surgeon, who may have one assistant when there are six companies, and two for eight or more companies. If a corps exceed a strength of twelve companies, it is customary to divide it into two battalions. The volunteer corps were originally raised under an act of 1804; but the circumstances of modern times having rendered various supplementary enactments necessary, the whole were embodied in a new act, the 26 and 27 Vict. cap. 65 (1863), under which, and the "Regulation of the Forces Act, 1871," and under Orders in Council issued from time to time, the volunteer force of Great Britain is now constituted.

All officers are appointed by the crown, except sub-lieutenants, who are nominated by the lords-lieutenant of counties; the non-commissioned officers are appointed by the officers commanding. Adjutants and sergeant instructors are at all times subject to the Mutiny Act—the other officers (and men) are subject to it only

when their corps is embodied; but the Queen can at any time deprive them of their commissions. Offences within corps, in time of peace, are punishable by fines or otherwise, as laid down in the rules of the several corps, which must have the approval of the Secretary of State for War. Every volunteer on joining must take the oath of allegiance, and must be of the age of 17.

The force may not be used in times of civil disturbance, but may be embodied for active service anywhere in Great Britain, whenever the country is invaded, or invasion is apprehended by the crown. The occasion must first be communicated to parliament, or, if parliament be not sitting, to the country, by an order in council, and then the crown may direct the general commanding in districts to call out any or all of the volunteer corps in their respective commands for active service. Corps so called out come under the Mutiny Act, and are bound to march whithersoever the general may command. While embodied, officers and men are entitled to the same pay as in the regular army. In point of precedence, volunteers rank with, but after, the same ranks in the army and militia. The yeomanry are reckoned as part of the volunteers. Among themselves, the volunteers rank in the following order: 1st, Light Horse; 2d, Artillery; 3d, Engineers; 4th, Engineers and Railway Transport Corps; 5th, Mounted Rifles; 6th, Rifles.

Members of a corps are honorary and enrolled. The first are merely subscribers of a certain amount; they are entitled to wear the uniform, but not to interfere in any manner in the corps. The enrolled members are the actual working-men; they are classed as "efficient" and "non-efficient"—the efficient being those who are certified by the commanding-officer and the adjutant to have a competent knowledge of the duties of the service, and to have attended the following number of drills:

ARM.	For Recruits during a period not exceeding Eighteen Months preceding the date of the Annual Return.	For others during each Twelve Months.
Light Horse	19 squad or troop drills.	9 troop drills, 8 of which have been drills of the whole corps.
Artillery Volunteers	30 drills, of which 24 are gun-drills.	12 gun-drills.
Engineers.....	12 engineering and 24 other drills.	6 engineering and 9 other drills.
Mounted Rifles.....	19 drills.	9 drills, of which 3 of the whole corps.
Rifle Corps.....	30 drills.	9 drills, of which 3 at least battalion drills.

The assistance afforded by the public to volunteer corps consists in the supply of adjutants; and of sergeant-instructors in the proportion of 1 to a corps of three companies or less, 2 from 4 to 7 companies, 3 up to 12 companies, &c. The money aid is a *capitation grant* of 80s. annually for each volunteer who is efficient, including officers, in addition to which there is a special grant of £2, 10s. for each officer and volunteer sergeant who holds a certificate of proficiency (for which a severe examination has to be passed). In scattered administrative battalions, a charge of 5s. for each efficient is allowed to cover the cost of attending battalion drills. These allowances are, however, none of them personal, but are granted to corps, to be expended by the adjutant, who is accountable to the War Office, within certain limits, according to the discretion of the commanding-officer. Government likewise provides all the arms, and a certain quantity of practice—ammunition. Corps are allowed to choose their own uniform, subject to the approval of the lord-lieutenant; but no gold lace or gold buttons may be introduced among these citizen soldiers. Volunteer corps do not bear colors. The system has not yet been extended to Ireland.

VOLUTE, in Architecture, the spiral ornaments of the Ionic and Corinthian capitals, probably derived from Assyrian architecture, in which it is also used.

VOLUTIDÆ, a family of gastropodous molluscs, of the section *Pectini-branchiata*, all marine, having a spiral shell, which is turreted or convolute, the aperture notched in front, the *columella* obliquely plicated; no operculum. The animal has a very large foot, and a recurved siphon. The species are numerous, and abound chiefly in tropical seas. Many of them have very beautiful shells, much prized by shell-collectors. Several small species are found on the shores of Britain, of which *Voluta tornatilis* is the only one that is not rare. This genus makes its appearance in the Cretaceous strata, and increases in numbers in Tertiary deposits, no less than 50 species being known in the Pleistocene beds.

VO'LVOLX, a genus of minute organisms, the type of a family called *Volvocineæ*, now regarded as vegetable, and ranked among *Protophytes*, but which were at first supposed to be animals, and were reckoned by Ehrenberg among *Infusoria*. They are globular, or nearly so, are found in stagnant water, and move slowly through the water, revolving round an axis, by the agency of numerous little filaments which project from green points on their surface. It was on account of their motions that they were formerly thought to be animalcules, and, partly on the same account, it has been suspected that they are not really protophytes, but *zoospores* of some kind of algae. This opinion, however, is rendered improbable by their apparently possessing the power of reproduction; green granules being formed within the parent globe, at first adhering to its wall, and afterwards becoming detached; the parent globe finally bursting, to allow them to escape. These frequently exhibit, even whilst within the parent globe, a rotatory motion similar to its own. The presence of starch in the interior of the *Volvocineæ* has been detected by means of iodine, and is regarded as a conclusive proof of their vegetable nature. The most common and best-known species is *Volvox globator*, which is just visible to the naked eye. It is a transparent sphere having its surface studded with innumerable green spots, united by a beautiful net-work. From six to twenty young are often to be seen in its interior.

VO'LVULUS (Lat. *volvere*, to twist) is the term used in Medicine to signify a twisting of the intestine, producing obstruction to the passage of its contents. There are three distinct varieties of rotary movement capable of giving rise to volvulus—(1.) A portion of intestine may have become twisted on its own axis, and, in that case, even semi-rotation brings the intestinal walls into contact, so as to close the passage. This is a rare condition, and only occurs in the ascending colon. (2.) The Mesentery (q. v.), or a part of it, may be twisted into a cone, dragging the intestine with it; the mesentery being the axis, and the intestine being rolled upon it. This form occurs in the small intestine. (3.) A single portion or a coil of intestine may afford the axis round which another portion, with its mesentery, is thrown, so as to compress it, and close the passage. A coil of small intestine, the sigmoid flexure or the cæcum (see DIGESTION, ORGANS OF), may form the axis. All these varieties occur chiefly in advanced life, and their seat is commonly towards the posterior unyielding wall of the abdominal cavity, the smoothness and yielding nature of the parts anteriorly rendering such an event impossible. The symptoms of twisting of the intestine, especially of the sigmoid flexure, which is the most common seat of the affection, are usually very well marked from the beginning. Great pain is suddenly experienced in a small circumscribed spot of the abdomen, obstinate constipation usually setting in from that date. If the sigmoid flexure, which lies just above the rectum, is the seat of the twisting, the abdomen soon becomes distended, especially on the left side, the distention being much more marked than when the twist is in the small intestine, as might physiologically have been expected. Vomiting, often constant and copious, is usually present. These cases are so desperate in their nature, that it is needless to enlarge upon their treatment. Attempts to remove the displacement by injecting water or air into the intestine by means of a long tube, have often been made, but with very slight success. Mr. Pollock, in his article on "Disease of the Alimentary Canal," in Holmes's "System of Surgery," remarks, that "relief in twist of the sigmoid flexure is just possible without opening the abdomen, provided the long tube be introduced into the distended gut, its contents drawn off, and the twist be reduced by the altered position of the bowel. But no operation for the ultimate relief of the patient will be successful unless the intestine be unloaded first, and the twist then reduced."—Vol II. p. 188. The operations that

have been proposed for the relief of this and other intestinal obstructions are so often fatal, and, even when successful, leave the patient in so wretched a state, with an artificial outlet for the discharge of the contents of the bowels, that it is doubtful whether they should be recommended. It is simply a choice between almost certain death in a few days, and a possible chance of a prolonged (but usually a miserable) existence. There are, however, a few rules that should be universally known and attended to—viz., wherever symptoms such as we have described occur, aperients should only be given by the rectum, while opium should be freely given by the mouth. Leeches and hot fomentations should be applied to the seat of pain; and all solid food should be prohibited, the nourishment being given solely in the fluid form.

VO'MER, a bone which, in the human skeleton, forms part of the middle partition of the nose, and the lower edge of which fits into grooves between the apposed surfaces of the palatine processes of the upper jaw and palate-bones. It exhibits many modifications in the different classes of *Vertebrata*. It is specially noticed here because of the frequent occurrence of the term vomer in articles on fishes—a very important character being often found in the presence or absence of teeth on the vomer, that is, along the middle line of the roof of the mouth.

VO'MITING consists in the stomach emptying itself through the gullet and mouth. It is preceded by a feeling of nausea, a flow of saliva in the mouth, and the breaking out of perspiration; the countenance grows pale, a feeling of weakness spreads over the whole body, and the pulse becomes slow. At last the muscles of the abdomen and the diaphragm strongly contract, and the whole contents of the stomach are ejected with greater or less violence. The first matters to be ejected are the food and drink present, the mucus from the stomach and œsophagus, and lastly, bile from the duodenum. In cases of disease, abnormal substances are sometimes vomited, such as blood, fragments of the intestines, and even excrementitious matters. When the vomiting is over, it is followed by languor and drowsiness, or, if the excitement was inconsiderable, the usual state immediately returns.

The causes of vomiting are various. In the first stages of infancy, it is almost normal, and occasions no disturbance of the system. In many animals, too, it is a normal function of life, as when birds of prey reject the hair and feathers of their victims. The infant gets rid of the superabundant milk it swallows by throwing it up with no trouble. Some persons can excite themselves to vomit by swallowing air.

The immediate cause of vomiting may be reduced, according to Dr Carpenter, to the three following categories: "(1.) The contact of irritating substances with the mucous membrane of the stomach itself; these, however, cannot act by *direct* stimulation upon more than its own muscular coat; and their operations upon the associated muscles must take place by *reflexion* through the nervous circle furnished by the pneumogastric and the motor nerves of expiration. (2.) Irritations applied to other parts of the body, likewise operating by *simply reflex* transmission; as in the vomiting which is consequent upon the strangulation of a hernia, or the passage of a renal calculus; or in that which is excited by the injection of tartar emetic or emetin into the circulating current, when these substances probably produce their characteristic effect by their operation on the nervous centres. (3.) Impressions received through the *sensorial* centres, which may be either sensational or emotional, but which do not operate unless they are *felt*. In this mode seems to be excited the vomiting that is induced by tickling the fauces, which first gives rise to the sensation of nausea; as well as the vomiting consequent upon disgusting sights, odors, or tastes, and upon those peculiar internal sensations which are preliminary to seasickness. The *recollection* of these sensations, conjoined with the emotional state which they originally excited, may itself become an efficient cause of the action, at least in individuals of peculiarly irritable stomachs, or of highly sensitive nervous systems."—"Principles of Human Physiology," 6th ed., p. 77.

According to the oldest doctrine respecting vomiting, it was held to arise solely from convulsive movements of the stomach, which was thought to take on a motion contrary to the usual peristaltic motion. Bayle advanced the opinion, that the stomach is quite passive in the operation, and that its contents are emptied entirely by its being compressed through the contractions of the abdominal muscles and the diaphragm. An apparently conclusive experiment of Magendie's, in which the

stomach was removed, and a bladder substituted for it, had more recently, (in 1813) satisfied most physiologists as to the passiveness of the stomach in vomiting, until Bédard and Budge shewed the insufficiency of his experiment. It is found, in fact, that in vomiting there are two sets of actions, viz., (1) contractions of the abdominal walls, while the diaphragm remains fixed, and forms a support to the stomach, and (2) the stomach itself performs jerking movements, the pylorus, or inferior orifice, at the same time closing, while the cardiac sphincter relaxes, without which last-named action vomiting is impossible; and that either of the two kinds of movement—the abdominal or the stomachal—may eject the contents of the stomach into the gullet.

In the treatment of vomiting, we must consider it as a symptom rather than as a malady. Where the stomach is irritated, relief is afforded, according to circumstances, by drinking cold water, aerated or soda water, or, if necessary, by opium or nuxvomica. Cold applications outwardly also do good. In other cases, infusions containing ethereal oils—camomile, coffee, &c.—astringents, or correctives for acidity—magnesia, soda, &c.—are the fitting remedies. When the irritation is in the brain, the best remedy is a horizontal position, with composure and darkness. If a person in sound health is suddenly seized with vomiting, poisoning may be suspected.

VONDEL, Joost van den (pr. *Yosf*), the greatest Dutch poet, was born at Cologne, November 17, 1587, his parents, who were Anabaptists, having fled from Antwerp to avoid persecution. His maternal grandfather, Peter Kraen, ranked among the poets of Brabant. When freedom began to raise the head in Holland, the elder Vondel removed with his family to Utrecht, and afterwards to Amsterdam, where he prospered in trade. The poet's education in boyhood was limited to reading and writing, but his perseverance and love of study enabled him in after-life to become intimately acquainted both with ancient and modern literature.

At the early age of 13, his poetical efforts were praised by Hooft. In his 23d year, he married Maria de Wolf, to whose clever management V. chiefly left his business as a hosier, while he devoted himself to study and poetry. The tragedies of V. are very numerous, and the grandest specimens of Dutch literature. His satirical writings and epigrams are full of fire, energy, and spirit. One of his most remarkable pieces is "Lucifer," published in 1664, strikingly resembling Milton's "Paradise Lost," which appeared thirteen years later. V. took an earnest and active part in favor of the Remonstrants, Grotius and Oldenbarnevelt, drawing down on himself the anger both of the clergy and court, whom he attacked with the keenest satire.

"Gysbrecht von Aemstel," "Adam in Banishment," "Palamedes," "The Batavian Brothers," "Solomon," "Samson," "Adonijah," "Noah, or the Destruction of the Old World," "Mary Stuart," &c., are splendid efforts of genius. "The Harpoon," "The Horse-comb," and the "Decretum Horribile" are stinging satires on the ruling powers both in church and state. V.'s translations from the Greek and Roman writers are numerous, the "Metamorphoses" of Ovid having been rendered into Dutch verse when he was 84 years old. V. left no subject untouched, no measure untried. His works (9 vols. quarto) contain many sea-songs, and more than 100 odes. Many of the later poems were written with a strong Roman Catholic spirit, he having joined that church about 1640. Through the imprudences of his son, to whom he had given his business, V. fell into straitened circumstances, and in 1668, accepted a situation in the the City Pawnbroking Office. In 1668, the magistrates allowed him to retire with his salary of 650 guilders yearly, which kept him above want. He was of moderate stature, well made, and had an eagle eye. After his powers of body and memory had begun to fail, he could still read without glasses. He died calmly on the 5th of February 1679, at the age of 91, and was carried to his resting-place in the new church, Amsterdam, by fourteen poets, himself *Princeps Poetarum*.

VOPADEVIA is a celebrated grammarian of India. He wrote a grammar entitled "Mṅgīabodha," which is held in high repute, especially in Bengal, and was commented upon by *Durgadāsa*. (Both text and commentary have been edited at Calcutta in 1861; previous editions contain merely the text of V.'s grammar.) It differs from the great work of Pāṇini (q. v.) in its arrangement as well as in its terminology; and without the commentary of *Durgadāsa*, would not yield by far the information that may be derived from Pāṇini's grammar. It is valuable, however,

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on account of many later Sanscrit formations, that could not be contained in the older work. V. composed also a catalogue of Sanscrit *dhātus*, or so-called radicals, in verse, called "Kavikalpadruma" (published at Calcutta, 1848), and a commentary on it, the "Kāvya-kāmadhenu." Another grammatical work, the "Rāmavyākaran'a" is likewise attributed to his authorship. According to a general tradition prevalent in India, V. would also be the author of one of the most renowned Purāṇ's (q. v.), the "Bhāgavata-Purāṇ'a;" and in a little treatise, the *Durjana-mukha-chapel'ikā*, or "a slap on the face of the wicked," which is avowed to this tradition, and maintains that Vyāsa (q. v.) was the author of this Purāṇ'a; three other works of a religious character are assigned to V.—viz., the "Paramahansa-priya," "Muklāphala," and "Harilīlā." A little medical work, the "S'atas'lokachandrikā," though written by a Vopadeva (see Professor Anfrecht's "Catalogue of the Sanscrit MSS. of the Bodleian Library"), does not seem to belong to the author of the works just mentioned. The date of V., given by some as the 12th, by others as the 13th c. after Christ, is, according to Burnouf's investigation, the second half of the 18th century.—See E. Burnouf's Preface to his edition, and French translation, of the first nine books of "Le Bhāgavata Purāṇ'a," vol. i. (Paris, 1840).

VORANT, in Heraldry, a term applied to an animal represented as swallowing another; as, a sable, a dolphin naant, vorant a fish proper.

VORONEJE, or Voronez (pronounced *Voronezh*), a government in the south of Great Russia, bounded on the s. by Little Russia and South Russia. Area, 23,712 sq. m.; pop. (1870) 2,152,696, consisting of Russians and German colonists. It is watered by the Don, its two navigable tributaries, the Voroneje and Khoper, and other streams. The soil, mostly a black mould, is generally fertile, and great crops of grain—wheat, rye, barley, oats and millet (which supply the inhabitants and local distilleries, and are exported)—are produced. Cattle and horses of a good breed are reared—the best studs belong to the crown. The principal manufactured articles are brandy, beer, cloth, beet-root, sugar, skins, wax-candles, soap, tobacco, and potash; and corn, tallow, hemp-seed, cattle, and horses are exported to Moscow, St. Petersburg, &c.

VORONEJE, a town of Great Russia, capital of the government of the same name, stands on the right bank of the Voroneje, 150 miles southwest of Tambov. It was founded in 1596 as a bulwark against Tartar invasion. Peter the Great, who had previously visited the town, built a fortress and a dockyard here in 1694. Besides two cathedrals, the town has many important civil, ecclesiastical, and educational institutions. The commerce of V. is extensive—the chief articles of trade being corn, hemp-seed, and tallow. Pop. (1867) 41,592.

VO'RTEX (Lat. a whirlpool). Till lately, it was a reproach to Hydrodynamics that the theory of vortices or eddies in fluids had not been properly brought under the domain of mathematical analysis. Even now, the problem has only been partially solved by the labors chiefly of Stokes (q. v.) and Helmholtz (q. v.), as their beautiful investigations apply only to *perfect fluids*, that is, fluids which oppose no frictional resistance to change of shape. In ordinary motions of perfect fluids, such as currents and waves, the instantaneous change of shape of a small spherical portion makes it an ellipsoid by simple extensions and compressions *without* rotation. The essential characteristic of vortex-motion is, that it involves rotation of some parts of the fluid. Helmholtz has shown that this rotational or vortex-motion remains with the parts of the fluid which first have it, and cannot be transferred. We can conceive no process by which vortex-motion could be given to, or taken from, a perfect fluid; for to our reason fluid friction (which does not exist in a perfect fluid) would seem to be indispensable. On such abstruse subjects we cannot of course enter here; but one result of Helmholtz's investigations is so curious that we must mention it. We are all familiar with those singular smoke-rings which are produced when a mortar is fired; or when, on a smaller scale, a bubble of phosphorated hydrogen takes fire in air, or a smoker skilfully emits a puff of tobacco-smoke. A very simple mode of producing them, on even a large scale, is to bore a hole in one side of a box, remove the opposite side, and substitute a cloth or sheet of india-rubber for it. A slight blow on this membrane ejects a vortex-ring from the hole. To make this vortex visible, we may burn phosphorus or moistened gunpowder in the

box; or still better, sprinkle its interior with ammonia, and introduce a vessel containing common salt and sulphuric acid. The sal-ammoniac cloud which fills the box is admirably adapted to display the rings. The general character of these rings, or vortex-tubes, indicates that, besides a progressive motion as a whole, the ring revolves about its own central or medial line. Suppose two such rings to follow each other, with their planes parallel, and their centres moving in the same line, Helmholtz shews that (at least in a perfect fluid) the foremost will relax its speed, and spread out into a larger ring, while its follower will contract, and quicken its pace, till it passes *through* the other, which in turn becomes the pursuer, and so on. This very curious result may be realised in a tea-cup, by drawing the half-immersed bowl of a tea-spoon along the surface of the tea for a short way, and withdrawing it. Two little whirlpools, or vortices, are then seen moving side by side. They are sections of the half vortex-ring which has been formed in the liquid by the spoon. A second half-ring may be at once sent after them by another stroke of the spoon, and the phenomenon above described will be obtained. When, on the contrary, two such vortex-rings *meet*, their centres moving in one line, they both spread out, and relax their speed indefinitely. This is obtained in a liquid by letting the half vortex-ring impinge directly on the side of the vessel, when it spreads out, and relaxes its speed; just as if there were no boundary of the fluid, but a second vortex-ring occupying the place of the image of the first which would be formed by a plane mirror substituted for the side of the vessel. When one vortex-ring impinges obliquely on another, it rebounds from it, and both are thrown into vibration, their form of equilibrium being circular. They act in fact in this respect like solid india-rubber rings. By forming them from an elliptic aperture, they are produced in a state of vibration. A square aperture gives them in a different state of vibration.

The impossibility of producing or destroying vortex-rings in a perfect fluid—save by creative power—has led Sir W. Thomson (q. v.) to regard the ultimate parts of matter as vortices of various kinds in a perfect fluid.

The word vortex has also come into use in connection with Descartes's once celebrated theory of the universe, given in his "Principia Philosophiæ." In this the rotation of the planets about the sun, the satellites about the planets, &c. were explained (!) by the hypothesis of vortices forever whirling about the central body. Descartes was a good mathematician, but in Natural Philosophy he preferred metaphysics to experiment, and of course erred enormously. But he is not to be laughed at: mistakes more ridiculous than his are gravely propounded at the present day.

VORTICELLIDÆ, a family of *Infusoria* remarkable for beauty, and containing a great number of species, to which, from their form, the name of *Bell* or *Bell-flower Animalcules* is often given. The genus *Vorticella* consists of minute cup-shaped or bell-shaped creatures, each placed at the top of a long flexible stalk, the other end of which is attached to some object, as the stem or leaf of an aquatic plant. Around the edge of the bell or cup is a fringe of rather long cilia, the motion of which brings food to the mouth. The stem is flexible, and is sometimes stretched out to its full length, sometimes contracted in a spiral form. The contraction takes place instantaneously upon any alarm, the cilia at the same time vanishing; and it is very interesting to watch a group of *Vorticella*, which may often be easily done with a Coddington lens, when they adhere to the inside of the glass of an aquarium. The stem is often beautifully branched, the *Vorticella* becoming a compound animal, like many zoophytes, and the whole contracts or is extended at once. The stem, slender as it is, is a tube, through the whole length of which runs a minute, muscular thread. A cup or bell of a *Vorticella* sometimes develops a new fringe of cilia at its point of junction with the stem, becomes detached from the stem, and begins to move freely through the water, till it finds a new place on which to fix itself, reproduction thus taking place by gemmation. Reproduction also takes place by encapsulation. See *INFUSORIA*. To this family belongs the genus *Stentor*, having a trumpet-shaped body, and therefore receiving the popular name of Trumpet Animalcules. They swim freely through the water, at the same time rotating on an axis, and attach themselves to objects by a sucker at the lower or narrow end. They have a fringe of cilia round the mouth, and the body of some species is covered with cilia. They are very voracious. They may often be found adhering to a twig or the stem of an aquatic plant, collapsed into minute masses of green jelly.

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VOSGES, a dep. in the north-east of France, formed out of the south part of the old province of Lorraine, is bounded on the n. by the departments of Meuse and Meurthe, and on the e. by Alsace-Lorraine. Area, 3266 sq. m.; pop. (1872) 592,933. The surface is mountainous, the territory being traversed not only by the Vosges Mountains, which run along its east border, but also by the Faucilles Mountains, which cross the dep. from east to west. The chief rivers are the Moselle, and its tributaries the Meurthe, Modon, and Mortagne, all of which flow in a north or north-west course through this department. The mountains in the east are covered with vast forests of beech and fir, and at the base of the mountains are tracts of pasture or rolling infertile plains. The west part of the dep., called the *Plaine*, is very fertile in cereals, vegetables, and fruits. Among the hills, the climate is cold; on the *Plaine*, it is humid. About 4,400,000 gallons of wine are produced annually. Mineral riches abound, there being iron, lead, copper, cobalt, and antimony min. s. Of the kind of cheese called *Géromé*, 23,600 cwts. are made annually. The dep. is divided into the five arrondissements, Epinal, Mirecourt, Neufchâteau, Remiremont, Saint-Die. The capital is Epinal.

VOSGES MOUNTAINS (Lat. *Vogesus*, Ger. *Vogesen* or *Wasgau*), a range of mountains in the north-east of France and the west of Germany, run from south to north, on the left bank of the Rhine, from the borders of the départements Haute-Saône and Doubs, north to Mainz, and separate Alsace from the French departments of Vosges and Meurthe and the German Lorraine. The range runs parallel with the Schwarzwald or Black Forest in Baden and Württemberg, on the right bank of the Rhine, and forms the western border of this part of the Rhine basin. The summits are rounded and regular in outline, and are called *ballons*. The chief of them are the Ballon de Guebwiller, 4690 feet; le Hoheneck, 4429 feet; and the Ballon d'Alsace, 4101 feet. They are covered with forests, and abound in rock-salt, silver, copper, lead and coal.

VOSS, Johann Heinrich, one of the foremost classical writers of Germany, was born in 1751 at Sommersdorf in Mecklenburg, of poor parents. In 1773, he went to the university of Göttingen, and there joined the "Hainbund," an association of young poets, at the head of whom stood Bürger and Boje. V. first intended to devote himself to theology, but soon exclusively turned to Greek and Roman antiquities, under Heyne's auspices. In 1778, he went from Wandsbeck, whither he had gone for the purpose of editing the "Musenalmannach," to Otterndorf, in Hadeln, where he prepared his translation of the "Odyssey." This appeared in 1781, and was received with universal applause. In the next year he became rector of Eutin, whence, in 1789, he issued his German translation of Virgil's "Georgics." This was followed, in 1798, by a new and revised edition of the German "Odyssey" and "Iliad," which, however, did not meet with as favorable a reception as the first. His contests with Heyne (q. v.) gave also rise chiefly to his "Mythological Letters," which appeared in 1794. Among his purely German poetical works, "Luise," an Idyll (1783, revised 1795), takes a foremost place. In 1799, he issued the whole of Virgil in a German translation. In 1802, he went to Jena, where he wrote the celebrated review of Heyne's "Iliad." In 1805, he was called to Heidelberg, where he wrote annotated German translations of Horace, Hesiod, Theocritus, Bion, Moschus, Tibullus, and Lygdamus. In 1821, he published a translation of Aristophanes, and a new edition of Horace and Virgil. Among other literary labors must also be mentioned his translation (with the aid of his two sons) of Shakespeare's works, which, however, is very inferior to Schlegel's. In opposition to Creuzer's "Symbolik," he wrote an "Antisymbolik" (1824), in which he lifted up his voice against exaggerated phrases of heathen mysticism; and one of his last papers was a violent denunciation of his former friend Stolberg, who had turned Roman Catholic. He died at Heidelberg in 1826. Among his translations from modern languages may be mentioned that from Galland's "Arabian Nights," and that of Shaftesbury's works. A brief mention may also be made of his two sons: (1) **HEINRICH**, born 1779, a philologist of merit, who assisted his father in his Shakespeare translation, and who was a great friend of Jean Paul's. He had intended to edit the latter's works, but died before him, in 1822. (2) **ABRAHAM**, born at Eutin, Professor of the Gymnasium at Krenzbach, who completed the Shakespeare translation. He died in 1847.—See Paulus, "Lebensund Todeskünden von J. H. Voss" (Heidel. 1826).

VOSSIUS, Gerard, one of the most distinguished scholars of the first half of the 17th c., was born of Dutch parents near Heidelberg, where his father was a Protestant minister. His father's name was Jolin Voss, but he, after the fashion of the time, had Latinised it into *Johannes Vossius*, and hence his son called himself *Gerardus Johannus V.*, that is, Gerard, the son of John. In 1578, the family returned to Holland, and settled at Dordrecht, where V. went to school. He afterwards distinguished himself at the university of Leyden; and when 23, he returned to Dordrecht, to become the principal of the school of which he was the most distinguished pupil. He married shortly afterwards, but his wife died in 1607, leaving a family of three children. In the same year he again married, and by his second wife he had two sons and five daughters. In the earlier part of his life, V. does not appear to have published much, but he became known to his countrymen as a scholar and theologian; and his assiduity in study may be inferred from the fact that he would never allow a friend to stay with him more than a quarter of an hour. In 1614, he became principal of the theological college of Leyden, and while holding this appointment, published a work on Pelagianism (*"Historia Pelagianæ"*). In it he spoke of the Arminians in an apologetic tone, and thereby brought down upon himself the wrath of a large section of the Dutch clergy; which caused him to be deprived of his office in the theological college, and of the income derived from it. His work had attracted attention in England, and it was some compensation to him that he received from Archbishop Laud an office which brought him £100 a year without it being necessary he should live out of Holland. Chiefly, it appears, to secure the means of supporting his family, he retracted the opinions he had expressed, in his book *"De Historicis Latinis,"* published in 1627, and he became reconciled to the church. In 1633, he was appointed Professor of History in a new university at Amsterdam, where he seems to have devoted himself to the completion of the great works on which his fame rests. Among the most important of these not mentioned above were: *"Aristarchus sive de Arte Grammatica, Libri VII.;"* *"De Historicis Græcis, Libri IV.;"* *"Commentariorum Rhetoricorum sive Oratoriarum Institutionum, Libri VI.;"* *"De Veterum Poetarum Temporibus, Libri II."* In 1649, V. was climbing the ladder of his library when it broke; he fell under the shelves and books, and died of the injuries he received.

The children of V. were remarkable for beauty, accomplishments, and learning. Grotius said of V. in epigrammatic Latin, that it was doubtful whether by his books or his children he had contributed most to adorn the age. Five of his sons, Denis, Francis, Gerard, Matthew, and Isaac, are known as authors.

VOSSIUS, Isaac, a scholar and theologian, was the only son of Gerard Vossius who survived him. He was born at Leyden in 1618. When 21, he published an edition of the *"Periplus"* of Scylax, the Greek geographer, with a Latin translation and notes. He afterwards travelled in Italy, collecting valuable manuscripts. In 1648, he took up his abode at the court of Queen Christina of Sweden; but in 1658, in consequence of a quarrel with Salmaïus, he returned to Holland. In 1670, he came to England, and here, although he openly scoffed at religion, he was appointed by Charles II. a canon of Windsor, and had apartments assigned him in the Castle. He died there in 1688, and it is recorded that on his deathbed he refused to take the sacrament, until one of his colleagues argued that he ought to do so for the honor of the chapter. His works are numerous, but not so important as those of his father.

VOTERS, Abduction of, is an offence punishable by fine or imprisonment, and by a penalty of £50 besides, which may be sued for by an informer. The offence is included under the head of undue influence, and by the 17 and 18 Vict. 102, s. 5, is defined to be, the directly or indirectly making use of, or threatening to make use of, any force, violence, or restraint, in order to induce or compel such voters to refrain from voting at any election.

VOTIVE (Lat. *votivus*, given in virtue of a vow; Fr. *votum*, a vow). In ecclesiastical use, signifies the class of actions, offerings, or memorial records or observances, which are intended either as the fulfilment of a vow, or as a commemoration of the accomplishment of the prayer which accompanied the vow. Of such votive engagements there are numerous examples in the Old Testament (Levit. xxii. 18, Dent. xii. 6), as well as in the ancient religions of the Gentile world; and the ec-

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classical historian Theodoret ("De Cur. Græc. Affect.," i. 8) alludes to the practice in his own day of hanging up, in the churches dedicated to the saints, little models of hands, feet, eyes, &c., in votive commemoration of the cure of lameness, blindness, and other maladies supposed to have been obtained through their intercession. The same practice continued throughout the succeeding centuries and throughout the medieval period, and still prevails in Roman Catholic countries, especially in Italy and Southern Germany. Votive offerings, often of very considerable value, may be seen in the churches of most of the great Sanctuaries (q. v.), and in other churches in special repute as places of devotion. The offering very frequently takes the form of a votive tablet, with an inscription detailing the event on which it is founded. Sometimes the offering is simply marked with the words *ex voto*, "in fulfilment of vow;" sometimes it is accompanied by a model in wax, in wood-carving, or even in precious metals, similar to those alluded to by Theodoret; and occasionally by a model of some object, which is meant to recall the memory of the favor received, as of a ship, in case of escape from shipwreck, &c. Many of the great churches, hospitals, monasteries, and other religious monuments of the middle ages and of later times, were built *ex voto*; and the treasures of the most of the rich cathedrals and other churches abroad contain objects of great value, the result of votive engagements on the part of the donors. The name *votive* is also applied in the Roman Catholic Church to the mass or other service, when it is celebrated—as is permitted on certain days and in certain seasons—not according to the rite prescribed for the day itself, but according to a rite selected by the celebrant himself from a number of such "votive masses" and "votive offices," as "of the Passion," "of the Holy Trinity," "of the Blessed Virgin Mary," &c., which are contained in the Missal and Breviary.

VOU-CHA'NG, or Woo-Chang, a city of China, in the province of Hoo-pe, on the Yang-tse-kiang, at the influx of the Han-kiang, about 350 miles southwest of Nanking. This is said to be one of the finest cities of China, famous for its learning and for its manufactures in metals. The pop. is stated at nearly 2,000,000.

VOUSSOIRS, the individual stones forming an arch, and of which the central one is the keystone. They are always of a truncated wedge-form.

VOW (Fr. *vœu*, from Lat. *votum*), a promise made to God of a certain thing or action good in itself, and within the dominion and right of the person promising. The practice of vows appears to have formed part of the religious observance of almost all races in any degree civilized; and it largely pervaded the whole ceremonial system of the Mosaic dispensation (Gen. xxviii. 20, Lev. xxvii. 2, 1 Chron. [I. Paralip. Viig.] xxix. 9, 2 Chron. xxxi. 6, Judges xi. 30, Num. xxx. 2, Judith xvi. 19, Jon. i. 16). The stringency of the obligation of fulfilling a vow when once made, is distinctly laid down (Deut. xxiii. 21; Eccles. v. 4, 5); but it is equally clearly stated, that it is by no means a matter of obligation to make a vow (Deut. xxiii. 23). The practice of making vows continued among the Jews in the time of our Lord; and St. Paul, after his conversion to Christianity, continued to conform to this usage (Acts xviii. 18). It would be out of place to enter here into the question, whether this observance was meant by our Lord to form part of his new dispensation, or to discuss how far the practice of vows, especially of chastity, can be traced as in use among the Christians of the first and second century; but it appears quite clear that in the end of the third, and all through the fourth, the monastic life became general in the East, and soon afterwards spread all over the church. See ANTONY, PAUL, MONACHISM. It is unnecessary to add, that vows, while discarded as a religious observance by the Reformers, enter largely into the system of the Roman Catholic Church. The objects of these engagements among Catholics are very various, but they are drawn for the most part, from what are called the evangelical "counsels," in contradistinction to "precepts" or "commandments"—the most ordinary subject of vows being the so-called "evangelical" virtues of poverty, chastity, and obedience. Pilgrimages, however, acts of abstinence, or other self-mortifications, whether of the body or of the will, special prayers or religious exercises, are frequently made the object of vows; and there is another large class of more material objects, as the building of churches, monasteries, hospitals, and other works of public interest or utility, to which medieval Europe was indebted for many of its most magnificent memorials of piety and of art. Vows in

the Roman Church law are either "simple" or "solemn." The principal difference between them consists in the legal effects of the "solemn" vow, which, where the subject of such vow is chastity, renders not merely unlawful, but null and void, a marriage subsequently contracted. A "simple" vow of chastity makes it unlawful to marry, but, except in the Jesuit Society, does not invalidate a marriage, if subsequently contracted. Catholics acknowledge in the church a power of dispensing in vows; but this is held to be rather declaratory than remissory, and it is not acknowledged in the case of vows which involve any right of a third party. Bishops are held to possess the power of dispensing in simple vows generally; but the power of dispensing in solemn vows and in certain simple vows, as, for example, that of absolute and perpetual chastity, and of the greater pilgrimages, is reserved for the pope. The practical operation of the canon law regarding vows has evidently been much modified, even in Catholic countries, since the French Revolution, and the subsequent political changes; but this must be understood to regard chiefly their external and purely juridical effects. So far as concerns their spiritual obligation, the modern Roman theology recognises little if any change.—See Ferraris, "Bibliotheca Canonica;" André, "Cours de Droit Canon;" Welter and Wetse's "Kirchen-Lexicon."

VOWEL. See LETTERS.

VR'HASPATI, or as the word is written in Vedic works, Br'haspati (from br'ā, probably hymn, prayer, and pati, protector, lord), is, in Vedic Mythology, the guardian of the hymns or prayers addressed by the pious to the gods, and he is therefore considered as mainly instrumental in insuring the efficacy of the sacrifice. In consequence, he is "the first-born in the highest heaven of supreme light," because the prayers reach him first; he is "even-faced," because his faces are the seven Vedic metres; and he is "attended by all the companies of gods," or "represents all gods," when the sacrifice is performed. Being thus the "first sharer of the offering," he is sometimes also identified with Agni. His function of guardian of the hymns being similar to that of a priest and spiritual teacher, he is further represented as a priest of the gods, who himself "celebrates worship;" as "the observer of truth," and as imparting "virtuous instruction." In the epic and Purānic mythology, V. figures especially as preceptor of the gods and Rishis, and as such he also causes them to perform sacrifices. A new character, however, in which he appears at that period is that of regent of the planet Jupiter; and in the ceremonies performed in honor of the planets and described in several Purāṇas, a special worship is paid him in this capacity.

VR'ITRA. See INDRA.

VU'LCAN (the name is probably connected with *fulgers* and *fulgur*, and may be translated the "bright or shining one") was the old Italian god of fire. The various myths in connection with V. prove the great antiquity of his worship. Latterly, the character, attributes, and history of the Greek Hephestus were transferred to V., and the two thus became identified. According to Homer Hephestus was the son of Zeus and Hera; later accounts, however, asserting that the latter gave birth to him without any co-operation on the part of her husband. He appears to have been twice violently expelled from Olympus—the first occasion was shortly after his birth, when he was dropped upon the earth by his mother, who was disgusted with his sickly deformity; he was received by the marine divinities, Thetis and Euronyme, with whom he dwelt for nine years. He afterwards returned to Heaven, and on interfering in a quarrel between his mother and Zeus, the latter seized him by the leg, and flung him from Olympus. After falling for a whole day, he alighted on Lemnos, where he was kindly received by the Sintians. He afterwards returned to Olympus. Homer makes him lame from his birth, while the later writers attribute this defect to his second fall on Lemnos. The popular notion of V. or Hephestus appears to have been that of a brawny, lame, good-natured, awkward god, often made the butt and laughing-stock of his fellows. He had a magnificent palace of his own in Olympus, "immortal, brazen, shining like stars," in which was his workshop, containing an anvil and 30 bellows, which worked at his command. Later accounts locate his workshop in the interior of some volcanic isle, such as Lemnos, Lipara, Sicily, &c., and give him as workmen the Cyclopes, Brontes, Steropes, &c. Many wonderful works of art are ascribed to V. by the ancient poets, and as an artist or artificer, he

appears to have been regarded as corresponding in some respects to Athens: both instructed men in the useful and ornamental arts, had the power of healing, &c., and at Athens, had temples and festivals in common. In the "Iliad," the wife of Hephestus is Charis; while in the "Odyssey," and in later writers, he is represented as being much tormented by the amours of his frail and charming spouse Aphrodite, with her favorite Ares (Mars). In the earlier statues, his lameness appears to have been indicated; but latterly, he was represented as a full-grown, vigorous man with a beard.

VULCANISM, a term proposed by Humboldt to include all the evidences of internal heat, such as volcanoes, hot springs, &c.

VULCANITE AND VULCANIZED INDIA-RUBBER. See CAOUTCHOUC.

VULGATE is the name of the Latin translation of the Bible, which is the received version in the Roman Catholic Church. It must not be confounded with the older Latin translation known as the *Itala* (see *ITALIC VERSION*). While Jerome was engaged in correcting the *Itala* he conceived the plan of producing a completely new version of the Old Testament, done from the Hebrew text itself. He commenced this labor about 385 A.D., and completed it in 405. He also made an improved version of the *Italic New Testament*, and the two together received the name *V.* The discrepancies between the *V.* and the *Itala*, which had been made from the *LXX.*, were so numerous and important, that the charge of heresy and falsification of Scripture was openly preferred against the translator by Rufinus, and even St Augustine was doubtful for some time whether this charge might not be true. But gradually it made its way in the church, first in Gaul, then in Rome—chiefly through Gregory the Great—and finally throughout the West. About two hundred years after Jerome's death, it became the universally received version of the church. Not long, however, did it exist in its pure and unadulterated form. Partly through the influence of the emendated *Itala*, partly through the manifold general causes of neglect, hastiness, and the rest, which have gone so far to spoil almost every ancient MS., the text of the *V.* had become so corrupted, that in 802, Charlemagne commissioned Alcuin to revise it by old MSS., and to compare it with the original texts. This revision, however, to which afterwards came other "emendations," in the 11th and 12th c. (by Lanfranc, Archbishop of Canterbury, and Cardinal Nicolaus respectively), completely changed the original character of the work. Nor did the "Correctoria Biblica" (i. e., certain collections of commentated and revised texts, issued at the period), do much for the improvement of the corrupted MSS. The confusion between the different codices was chiefly remarked, when the Tridentine Council, in 1546, first declared the *V.* the authorised version of the Roman Church, and decreed the preparation of an authenticated edition. In 1564, the Papal Chair undertook the task; but not before 1590 did Sixtus V. produce the work. This, however, turned out to be so utterly incorrect and faulty throughout, that the copies were speedily suppressed; and another edition, which appeared in 1592, was prepared under Clement VIII., to which in the next year (1593) that other edition succeeded, which has since remained the normal edition of the Church of Rome, and has been reprinted unchanged ever since. We may add, that the Anglo-Saxon translation of the Pentateuch and Joshua, by Aelfric (10th c.), has been made from the *V.*, and not, as has been erroneously supposed, from the Septuagint; and that the *V.* has also been repeatedly translated into Arabic (the Psalms even into Persian) for the use of the Roman Catholics in the East.

VULNED, a heraldic term, applied to an animal, or part of an animal—as, for example, a human heart, wounded, and with the blood dropping from it. A pelican in her piety (see *PELICOX*) is sometimes described as vulning herself.

VULTURE (*Vultur*), a Linnæan genus of rapacious birds, now forming the family *Vulturidæ*, to almost all the species of which the name *V.* is popularly given. The *Vulturidæ* have a longer beak than the *Falconidæ*, and it is straight at the base, slightly or not at all toothed, the upper mandible longer than the lower, and hooked at the tip, the head generally bare, or covered only with a short down, which in most of the species is the case also with the neck—a ruff or collar of soft feathers surrounding the lower part of the neck, into which the upper part, and even most of the head can be withdrawn. The legs and feet are large, but the claws are not nearly

so large and strong as in the *Falconidae*, and are but slightly hooked. The middle toe is very long. The wings are long, and their expanse consequently great. Vultures have great powers of flight, and many of them soar to a very great height in the air. Their plumage has not the neat and regular appearance of that of the *Falconidae*, but it is dense, and not easily penetrated by shot. Vultures are mostly found in warm climates, and many of them are inhabitants of mountainous regions. They feed on carrion, which it seems to be their office in nature to remove from the face of the earth, that the evil consequences of its corruption may be prevented. They seldom attack a living animal, but they have been seen to sit and watch the approach of death, waiting for their feast. They are not in general courageous birds, and are often put to flight by birds much smaller than themselves; yet, if unmolested, they readily become familiar with the presence of man, and some of them seek their food even in the streets of towns, in which they are useful as scavengers. They gorge themselves excessively when food is abundant, till their crops form a great projection, and sit long in a sleepy or half-torpid state to digest their food. They do not carry food to their young in their claws, but disgorge it for them from the crop. The bareness of their head and neck adapts them for feeding on putrid flesh, by which feathers would be defiled; and they are very careful to wash and cleanse their plumage. The question has been much discussed, whether vultures discern dead animals by the eye, or are attracted to them by the smell. It is certain that they possess great powers both of smell and of vision, and the reasonable conclusion appears to be that both are of service in directing them to their prey. The rapidity with which they congregate to a carcass has been remarked with admiration, and vast numbers have often been seen assembled on a battle-field to devour the dead.

The *Vulturidae* are divided into several genera, of which one, *Gypætes*, approached to the *Falconidae* in its character and habits, having the head feathered, and not always feeding on carrion, but often attacking living animals. The Lammergeier (q. v.) is one of this group. The feet are feathered to the toes, whilst the other vultures have the tarsi bare.

Some of the most notable species of V. have already been described, as the Condor and the Egyptian Vulture. The generic name *Vultur* is now restricted to those which have the head and neck without feathers and without caruncles, and a ruff of long feathers or of down at the lower part of the neck. To this genus belongs the TAWNY V., or GRIFFON (*V. fulvus*), found in the south of Europe, the north of Africa, and the west of Asia. It makes its nest on the most inaccessible rocks of high mountains, as in the Alps and Pyrenees, and sometimes in tall forest trees. It is a very large bird, more than four feet in length. Its plumage is yellowish brown, the quills and tail-feathers blackish brown, the down of the head and neck white, the ruff white. When it has found a carcass on which to feed, it remains on the spot, gorging and torpidly resting by turns, till no morsel remains. This V. has been seen in England, but only as an accidental visitor. The mountains and forests of the south of Europe, as well as of the north of Africa, and great part of Asia, are also inhabited by the CINEREOUS V. (*Vultur* or *Gyps cinereus*), another large species which departs from the typical character of the vultures in having the greater part of the neck feathered, and comparatively large and powerful claws. It does not, however, attack living animals. India, Africa, and almost all warm countries, abound in vultures of different species, which it is unnecessary to describe. In the southern states of North America is found the BLACK V. (*Cathartes atratus*), there generally known as the CARRION CROW, a comparatively small species, not quite two feet in entire length, of a deep black color, the head and neck covered with warty excrescences, and a few hair-like feathers. This bird is also very abundant in many parts of South America, where it is called the GALINAZO. Very nearly allied to it, and found in the same regions, is the TURKEY BUZZARD, or RED-HEADED V. (*Cathartes aura*). These vultures are more or less gregarious, not only assembling where food is to be found, but flying in flock. They make their nests in hollow trees, and sometimes in the chimneys of deserted houses, or on the roofs of houses. In some of the towns of tropical America, they may be seen in great numbers, perched during the heat of the day on the tops of houses or on walls, asleep, with their heads under their wings. The CALIFORNIAN V. (*Cathartes Californianus*) is the largest rapacious bird of North America, being fully four

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feet long, and about ten feet in extent of wings. It is black, with a white band on the wings. It is found only on the western side of the Rocky Mountains. It much resembles the condor in its habits.

VYASA is the reputed arranger of the Vedas (q. v.), and the reputed author of the Mahābhārata (q. v.), the Purāṇas (q. v.), the Brahmasūtras (see VEDĀNTA), and a Dharmasāstra. According to tradition, he was a son of the sage Parāśara and Satyawati, the "truthful," who was a daughter of King Vasu, and a heavenly nymph, Adrikā. Another tradition makes him also the father of Dhṛtarāṣṭra, Pandu, and Vidura. On account of his dark complexion, he was called Kṛtsn'a (black); and because he was born in an island (dōṣpa) of the Yamunā (Jumna) river, his second name was Dwaipāyana. That the immense bulk of literature comprised by the above-named works, and relating to different periods, cannot belong to the authorship of one and the same personage, is no matter of doubt. But the name itself of the individual to whom it is attributed conveys the meaning which must be sought for in some of the legends connected with his history. Vyāsa (from the Sanscrit *vi* and *as*, literally, "throw in different directions," hence "distribute" means the person who arranges a subject-matter in a diffuse manner, or the act itself of such a diffuse arrangement, and is often contrasted with *samśa* (from *sam* and *as*, contract), the act of making a concise arrangement, or of abridging (compare the Greek *omero-*, from *om* = *sam* = *sun*, and *ar* = *as*). Vyāsa is, therefore, a symbolical representation of the work of generations, as embodied in the Vedas, the Mahābhārata, and the Purāṇas, and of the order which gradually was brought into this literary mass. When, therefore, the Vishṇu-Purāṇa speaks of 28 Vyāsas who in the reign of the present Manu arranged the Vedas, it is not impossible that some historical truth may underlie this statement, implying, as it does, a different arrangement of the Hindu scriptures at various times; and that the Mahābhārata, and the Purāṇas too, may have undergone various arrangements and recensions, until they settled down in their present form, sufficiently results from their contents. Regarding the Brahmasūtras, tradition itself seems only loosely to connect their author with the Vyāsa of the foregoing works, for it says that he was in a former life a Brāhman, *Apāntaratamas*, who, after having attained final beatitude, "by special command of the deity, resumed a corporeal frame and the human shape, at the period intervening between the third and fourth ages of the present world, and was the compiler of the Vedas." (See Colebrooke's "Miscellaneous Essays," vol. i. p. 327, Lond. 1837.) As the author of the Dharmasāstra, V. is possibly a personage distinct from the legendary individual bearing this name, as is the case with other Vyāsas who occur as authors of other works.

W

W, the twenty-third letter of the English alphabet, "is a letter which performs the double office of a consonant and a vowel." According to the decisive experiments of Professor Willis ("Cambridge Phil. Trans." lii. 221), the natural order of the vowels is *i, e, a, o, u*, or the reverse; in which the sounds must be understood to be those which prevail on the continent. The sounds, then, of *i* (that is, *ee*) and *u* (that is, *oo*) are the most remote, and the attempt to pass with rapidly from either of these to the others, more particularly to the other extreme, gives an initial breathing which has the character of a consonant, viz., in the one case, *ee-oo*, or *you*; in the other, *oo-ee*, or *we*." See Key's "Alphabet." This acute analysis of the articulations denoted by the characters *w* and *y*, throws a clear light on the double function they perform as consonants and as vowels. The letter *w*, which originated in the middle ages, is merely one *v* joined to another, as its English name imports. It is peculiar to the English, German, and Dutch alphabets. It would appear from a variety of phenomena in Latin and Greek, that the Lat. *v* or *u*, used as a consonant, as well as the old Greek digamma (**Ϝ**), were more of the nature of the modern *w*, than of the decidedly consonantal English *v* (see U and V). The French having, like the other Romanic nations, no character *w*, express the sound by prefixing *ou* to the vowel; as *ouit* (pron. *wee*). Edouard — Edward. In the beginning of proper names they substitute *gu*; e. g., Guillaume — William. The Spaniards also use *gu*, as in the many names compounded of the Arabic *wadi*; e. g., Guadalquivir; but more frequently *hu*, as in Chinuhna (pron. *Chiwawa*). In High German, which has become classical German, *w* is confounded with *v* and *v*, with *f*; thus, Wellington is pronounced *Vellington*. In Loudon, *w* is substituted for *v*, and *v* for *w*, with "a most amusing perversity."

WAAL, The (Lat. *Valis* or *Vahalis*), an arm of the Rhine, thrown off near the village of Pannerden, in the Netherlands, flows thence to Nijmegen, 11el, Nieuw-St-Andries, between the Boemmeler and Tieler-Waard, and unites with the Maas below Fort Loevestein (Luvestein). The united rivers then take the name of the Merwede, which, flowing past Gorinchem and Dordrecht, becomes the Oude, or Old Maas. See MAAS.

WA'BASH, a river of the U. S. of America, rises in Western Ohio, runs west and south-west through Indiana, forming the southerly half of its western boundary, on the borders of Illinois, to the Ohio River, 146 miles from its mouth, is 550 miles long, and navigable by steamers at high-water 300, and has for its principal branches the Tippecanoe, Big Vermilion, Embarras, and White River—the last 200 miles long. The Wabash and Erie Canal connects the lakes with the Mississippi.

WACE, Robert, an Anglo-Norman poet of the 12th century. Many different versions of his name are given in his own books, as well as in the other books which mention him. He is styled Wace, Wace, Wace, Wace, Wace; Gasse, Galce, Guace, Guuzi, Guaze, Guascoe, Gazoe; and again, Wistace, Huistace, Hnace. It has been supposed that there were really two poets, the one named Wace or Guace, the other named Wulstace; the one the author of "Le Roman du Rou,"

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the other of "Le Roman du Brut." But variety in writing names was very common in the middle ages, and it does not seem necessary to resort to this supposition. About his Christian name there is even more doubt than about his surname. It is never mentioned in his poems, from which the little that is known about him is mostly derived. An old writer speaks of him as Matthew; and it seems that he was first called Robert in the "Origines de Caen" by Huet, whom subsequent authors have followed.

W. was born in Jersey, in the reign of Henry I., and it is probable that the date of his birth lay between the years 1112 and 1124. He was taken to Caen as a child, and there he received the early part of his education. He was afterwards sent into the neighboring kingdom of France; but he returned to Caen, and having entered into holy orders, became a reading-clerk in the Royal Chapel there. At Caen it was that he composed his works. Henry II., to whom he dedicated "Le Roman du Rou," gave him a canonry at Bayeux, apparently about the year 1160. He died in England about the year 1180, certainly before the year 1184.

Five separate works are attributed to W.; but three are slight, short performances, and it is only necessary to notice the two principal—"Le Roman du Brut d'Angleterre," and "Le Roman du Rou." The former premises that a certain Brutus, a son of Ascanius, and grandson of Æneas, settled in Britain, and became its first king. The book continues the history of the British kings from Brutus to Cadwallader, who died at Rome shortly before the year 700. It is little more, however, than a literal translation into the French from the Latin of Geoffrey of Monmouth (q. v.). This poem seems to have been completed in the year 1155. "Le Roman du Rou" (Rollo) is a sort of history of the Dukes of Normandy and of the Norman monarchy in England. Neither of these works has the slightest poetical merit. They are both interesting only as shewing the state of the French language in the 12th c., and as supplying occasional facts and social traits to the historian.

WACKE, a German miners' term, introduced by Werner, to designate a soft variety of trap that has an argillaceous aspect, and a greenish-gray color. It resembles indurated clay, but has been formed of volcanic ashes or mud. It is often vesicular, and when the cavities are filled, it becomes an amygdaloid. It is associated with trappan rocks, and, indeed, often passes into basalt or greenstone.

WAD, the popular name given in some parts of England, as in Derbyshire, to an ore of manganese, which is a hydrated peroxide, united with nearly its own weight of oxide of iron. Wad is also the provincial name of black lead or plumbago in Cumberland.

WAD, in Gunnery, a compressible disc forced home in the barrel after the powder, to confine the latter to the least possible space before its explosion. For great guns the wad is commonly made of rope; for small arms, of pasteboard.

WADERS, or Wading-Birds, a designation often applied to the whole order of birds *Grallæ* (q. v.), or *Grallatores*, but really appropriate only to some of them, the more aquatic in their habits, as Herons, Snipes, and Rails.

WADHAM COLLEGE, Oxford. In the year 1610, James I. issued a licence to Dorothy Wadham, acting as executrix of the will of her deceased husband, Nicholas Wadham, Esq., to found a "College of Divinity, Civil and Canon Law, Physic, good Arts and Sciences, and the Tongues." Dorothy Wadham purchased the site and ruins of the priory of the Austin Friars, in the suburbs of Oxford, and built the present college for a warden, 15 fellows, 15 scholars, and 2 chaplains. The fellows were formerly elected from the scholars, and the tenure of the fellowships was limited to 23 years; nine of the scholarships were limited to certain counties, and to the founder's kin. By the Commissioners under 17 and 18 Vict. c. 81, the fellowships and scholarships were thrown open, the former to all persons who had passed the examinations for a B.A. degree; the latter to all persons under 20 years of age. The Commissioners also abolished the limitations on the tenure of the fellowships. At present, the number of fellowships is fourteen, one of them having been appropriated to the professor of experimental philosophy. The scholarships are worth £80 a year, besides rooms, and are tenable for five years. There are several good exhibitions, especially those founded by Dr Hody—four for Hebrew, and six for Greek, value £45 a year, and tenable for four years; also a law exhibition for a fel-

low, value £90 a year; and a medical exhibition for a fellow, of the same value. There are thirteen benefices in the gift of this college.

WA'DI, an Arabic word signifying a river, a river-course, a ravine, or valley. It is supposed that the Greek *oasis* is a corruption of *wadi*. It is of frequent occurrence in the names of places; e. g., Wadi-Musa (i. e., the Valley of Moses) in Arabia. In Spain, where most of the rivers bear names given them by the Arabs, *wad* has been transformed into *guad*; e. g., Wadi-l-abyadh (the white river), has become Guadalquivir.

WA'DSET, in Scotch Law, is the old name for a Mortgage (q. v.). The modern name is Bond and Disposition in Security. See **HERITABLE SECURITIES**.

WAFER, in relation to the Roman Catholic usage of the Eucharistic communion, is the name given (chiefly by non-Catholics) to the thin circular portions of unleavened bread which are used in the Roman Church in the celebration and administration of the Eucharist. In ancient times, the bread and wine for the Eucharist were contributed by the faithful; and a place is found in the Eucharistic service of every known liturgy for this offering, still known by the name of Offertory (q. v.). But in the Latin Church, for many centuries, the bread (which, as being unleavened, and different from that in common use, needed special preparation) has been provided by the clergy; and the practice has been followed of preparing it in the form of thin cakes, commonly, although not necessarily circular, and frequently impressed with sacred representations or emblems, as the Crucifixion, the Lamb, the Christian monogram the Cross, and other sacred symbols. The circular form itself is by some ritualistic writers regarded as symbolical, the circle being a figure of perfection. The wafers used in the Roman Catholic Church are made of different sizes, the smallest about an inch in diameter for the communion of the people, a second considerably larger for the celebration of the mass, and a third still larger to be placed in the Monstrance (q. v.) for the service of benediction or exposition. See **LORD'S SUPPER**.

WAFERS, thin discs of dried paste, mostly colored, used for sealing letters, or for attaching papers together. They are made by mixing fine wheaten flour with water and any non-poisonous coloring materials so as to form a mixture not thicker than thin cream. A small quantity of this is poured on the lower limb of a pair of wafer-irons, which are formed like a pair of pincers, but with flat blades about 12 inches long by 9 in breadth, the inner surface of which is kept well polished. Before being used, they are heated over a charcoal or coke fire; and the liquid paste being poured on the lower blade, the pressure of the two blades distributes it equally in a thin sheet between them, the superfluous material being squeezed out at the sides, from which it is shaved off by means of a knife. In a few seconds of time, if the blades are hot enough, the sheet of paste becomes dry and half baked. The sheets so formed are then stamped out into discs of the sizes required. Formerly, wafers were very extensively used, and their manufacture was one of considerable importance; but the introduction of gummed envelopes has almost driven them out of use.

WA'GENINGEN, an old but well-built town in the Netherlands, province of Gelderland, is situated near the Rhine, to which access is had from it by a canal. Pop. (1875) 6005. W. has good schools and other useful institutions. The environs are beautiful, and the Wageningsche Berg, now formed into a burying-place, is especially picturesque.

Ship-building, brick and tile making, tanning leather, rope-spinning, &c., with agriculture, are the chief sources of wealth. W. received the rights of a town in 1308. It is a neat, purely Dutch town, selected as a residence by many who wish to live quietly, comfortably, and economically.

WAGER OF LAW, in the Law of England, was an old form of giving sureties that at some future time the party would wage his law—that is, put it to the oath of the defendant, who swore in presence of eleven compurgators as to the debt claimed. The action was used in causes where there was some secrecy as to the origin of the debt, or where the defendant bore a fair character. That form of action had long been in disuse, but was not formally abolished till the statute of 3 and 4 Will. IV. c. 43.

WAGERS, in the Common Law of England, were held good, if they were not against the principles of morality, public decency, or sound policy; and a wager or bet was defined to be, a contract entered into without color or fraud between two or more persons for a good consideration, and upon mutual promises to pay a stipulated sum of money, or to deliver some other thing to each other, according to the result of some contingency. A wager has been held void which was made on the life of Napoleon I., on the result of an election of a member to serve in parliament, &c. Before the statute of 8 and 9 Vict. c. 109, wagers above a certain amount were declared to be illegal, but now wagers on a race are not illegal. That statute provides that all contracts or agreements, whether by parol or in writing, by way of gaming or wagering, shall be null and void, and the money due thereon cannot be recovered in any court of law; but that enactment does not apply to any subscription or contribution or agreement to subscribe or contribute to any plate, prize, or sum of money to be awarded to the winner or winners of any lawful game, sport, pastime, or exercise. If a sum of money has been deposited with a stakeholder, not as a stake, but by way of wager, it may be recovered back if notice is given to the stakeholder before the event comes off. As no wager can be recovered in a court of law, it is merely a debt of honor, and if paid, it is in the eye of the law the same thing as giving a gratuity. If a promissory-note or bill of exchange be taken as security for money either won by betting or knowingly lent for betting, the consideration is illegal, and the money cannot be recovered. A recent act was passed for the suppression of betting-houses, and imposes penalties on persons keeping or using houses for betting purposes (17 and 18 Vict. c. 119); and justices may authorise constables to break into such houses, and arrest all persons found therein. Whoever by a cheating wager wins money from another, is liable to be indicted for obtaining the money by false pretences.—In the law of Scotland, wagers are treated as *pacta illicita*, which it is beneath the dignity of any court to entertain questions about, and so they are not recoverable by action. The act 8 and 9 Vict. c. 109 does not apply to Scotland, but there are older statutes of a somewhat similar effect.

WAGES means the money given for personal services, as distinct from the price of anything sold, whether made by the seller or not. When a man makes a basket, and sells it, the price is not wages, though it may be the same thing to him. The term has by general usage been limited to the remuneration of hand-working. A manager of a bank or railway—even an overseer or a clerk in a manufactory, is said to draw a salary. It is generally a feature of wages, too, that they are paid at short intervals, as being necessary for immediate support. This division is connected with social distinctions which have exercised a baneful moral influence in the direction of improvidence. The clerk at a hundred a year is supposed to be a gentleman who dresses decently, and so adjusts his expenditure that he can draw it quarterly. The puddler or shingler who can make a guinea a day is, by traditional usage, a member of the needy classes, who requires to draw his wages weekly, and is expected to spend them at once. Wages are more absolutely ruled by their value in the market than other services. A writer of poems or a painter of pictures does work which is exceptional—if people are willing to pay him any price he may ask for his work, there is probably no one who can compete with him and undersell him. A lawyer or a physician may also have special qualities to a great extent excluding competition; and in appointments to offices requiring trust, judgment, and skill, a great many things have to be considered besides the question, who will do the duty cheapest? But in the staple hand-works—the making of clothes, the baking of bread, and the like—there are uniform functions of the hand which a certain number of persons will always be found ready to give for a price. Strong efforts are made from time to time—by combinations, strikes, &c.—to make wages fictitiously high. These efforts are of course often successful for a time, bringing profit to some members of the working-classes, though injury to others, and a general loss of the wealth of the community. But the great law of political economy, that labor as well as all other things, will bring what it is worth, ever prevails in the end in a country where trade and labor are free. See CAPITAL, COMBINATION, LABOR, TRUCK-SYSTEM.

WAGNER, Richard, a contemporary German operatic composer. He was born

at Leipzig in 1813, and was educated at Dresden and Leipzig. In 1836, he was *Kapellmeister* at Magdeburg, and after spending some time in Königsberg, Dresden, and Riga successively, he came to Paris in 1841, where he composed his two earliest operas, "Rienzi" and "Der fliegende Holländer." "Rienzi" obtained for him the post of Kapellmeister at Dresden. His next opera, "Tannhäuser," appeared in 1845. Being involved in the political schemes of 1848, W. had to quit Saxony, and resided for a time in Switzerland, where he composed "Lohengrin." He spent the season of 1855 in London, where he undertook the direction of the Philharmonic Society's concerts. In 1865, he was invited to Munich, and greatly befriended by the young king of Bavaria, who appointed him Director of the Opera-house; and he there produced his opera of "Tristan und Isolde" the same year; and, in 1868, "Die Meistersinger von Nürnberg," at the first performance of which W. sat beside the king in the royal box. Since that time, his energies have been mainly devoted to the securing of such representations of his works as he and his admirers regard as proportionate to their merits. W. has kept himself constantly before the public by pamphlets and the republication of favorable newspaper articles. W. unions have been formed in all the principal towns of Germany; and Baireuth, in the north of Bavaria, has been selected as the most suitable centre for a grand W. theatre, of which the foundation stone was laid with great ceremony, in May 1872, by the great composer himself, in the presence of a host of his admirers; and for the opening of which (1876) he prepared a great operatic tetralogy, "Der Ring des Nibelungen." In all his operas, the words of the libretto, W.'s own composition, are adapted to a declamatory style of recitative, relieved by harmonious and instrumentation in accordance with the spirit of the situation. They are often magnificent in spectacle, but are purposely deficient in what is commonly understood as melody. W.'s position amounts to this, that the highest mission and true end and object of music is only realised when it is the exponent of poetry; and that instrumental music is practically dead.

WAGON, a vehicle for the conveyance of goods or passengers, is mounted on four wheels, but varies considerably in the construction of its other parts, according to the species of traffic in which it is to be employed. Since the wagon has four wheels, it is quite unnecessary that any part of the weight should be sustained on the shafts, and accordingly these latter are hinged to the fore-part of the frame, so as to be raised or let down at pleasure. Wagons being generally drawn by two horses abreast, two pairs of shafts are employed; and when three horses are yoked abreast, the centre one is the shaft horse, the right and left "wheelers" are yoked by traces to the wagon-frame; and each of the latter is attached by a chain from its collar to a shaft, so as to preserve the parallelism of its action. Most wagons are set on springs, on account of the weight of the vehicle, and the absence of the steady weight of the horse, owing to the shafts not being immovably attached to the frame. For facility in turning, the fore-wheels are occasionally smaller than the hind ones; and in addition, the fore-axle of the lighter kinds of wagon is attached to the body of the wagon by a swivel-joint, the shafts or pole being in this case attached to the fore-axle; but the diminution of the size of the wheels is open to grave objection, on account of the greater friction. It being almost impossible for the beasts of draught to control and subdue the momentum of a heavily-loaded wagon descending a slope, it is necessary to employ a drag of some sort; the rudest forms of which are a thick cylinder of tough wood inserted between two spokes of the wheel, which, being carried upwards in the wheel's revolution, is "jammed" against the under side of the wagon-frame, and stops the wheel's rotation; and the *chain-drag*, which was merely a chain firmly fastened at one end to the wagon-frame between a fore and hind wheel, and furnished at the other end with a large hook, to hold the tire of the hind-wheel; the method of chaining the fore and hind wheels together was also employed. But in the better class of wagons, the *shoe* and *break* (see *DRAAG*) are now employed. The various forms of wagon in common use are the brewer's *drag*, the railway *lorry*, the agricultural *wain* (in common use in England and on the continent), and the *bullock-cart* of South Africa. The comparative merits of a vehicle in which the horse has merely to draw, and one, as the cart, in which he has to carry as well as draw, have often been discussed, though never sufficiently tested; but it seems to be generally believed that, despite the distress arising from his confined

positions in the comparatively immovable shafts of a cart, a horse can transport a greater weight to a moderate distance by the same exertion of muscular force in a cart than in a wagon.

WAGON-TRAIN, an indispensable companion of an army under this or some other title. It serves to convey the ammunition, provisions, sick, wounded, camp-equipage, &c. At the present time, in the British army, the Army Service Corps performs this function, although in China (1860) and New Zealand (1863—1865) the commissariat provided and organised its own wagon-service.

WA'GRAM, or Deutsch-Wagram, a village of Lower Austria, on the left bank of the Russbach, ten miles north-east-by-east from Vienna, is of little importance, except as the site of the great battle between the French and Austrians in the campaign of 1809, which forced Austria to bow before Napoleon, and submit to the onerous conditions of the fourth treaty of Vienna (q. v.). After the capture of Vienna, Napoleon resolved to pass the Danube, and complete the prostration of Austria's military strength by the destruction of her last army—that under the Archduke Charles; and with this view, he called in the Italian army, under Eugène Beauharnois, and all his outlying corps, concentrating them in and about the island of Lobau; and after a few feints, calculated to mislead the Archduke, who, stationed on the north bank, was vigilantly guarding the various crossings, succeeded in effecting a most extraordinary passage, on the morning of July 5, 1809, from the island of Lobau to the north bank, opposite Ebersdorf, landing 150,000 infantry, 30,000 cavalry, and 600 pieces of cannon before six in the morning. When the morning light shewed the Austrians how they had been out-manœuvred, they retreated across the plain of the March-field to its northern extremity, and took up a formidable position at W., and being closely followed up, were, on the evening of July 5, attacked by a part of the French army. By the vigorous exertions of the Archduke in person, the assailants—after a temporary success—were completely repulsed, and the Austrians, exulting in their second victory over Napoleon, waited in sanguine expectation the events of the next day. In the morning, the Archduke resolved to assume the offensive, and succeeded at first in defeating the French centre under Massena, and in forcing their left into inextricable confusion, followed by total rout; but at the same time his own left was turned by Davoust, and this success followed up by a successful attack of MacDonald on their centre, forced the Austrians to retreat, which they did in the most orderly manner, carrying with them 5000 prisoners, and leaving 25,000 dead or wounded on the field of battle—the French loss being about equal. This drawn battle (the Archduke having, as Savary says, “in reality no reason for retiring”) had all the moral effects of a victory for the French; and was followed on July 11 by the armistice of Znaim, which resulted in the fourth treaty of Vienna.

WA'GTAIL (*Motacilla*), a genus of birds of the family *Motacillidæ*, which is now very generally regarded as a sub-family (*Motacillinæ*) of *Sylviadæ*, distinguished by a lengthened and slender bill, long and pointed wings, rather long and slightly curved claws, and a long narrow tail, which the bird incessantly wags up and down, with a jerking motion. The genus *Motacilla* of Linnæus included many of the *Sylviadæ* not belonging to this group, as the Red-breast, Nightingale, Black-cap, and Blue-bird. The genus *Motacilla*, as now restricted, has a slender awl-shaped, straight bill; the nostrils oval, on the sides of the bill near the base, partly covered by a naked membrane; the wings of moderate size, the first quill-feather the longest, the second and third nearly as long as the first, the tertials very long; the tarsus much longer than the middle toe; the tail of twelve feathers, long, and nearly equal at the end.—The wagtails run with great celerity, and seek their food on the ground. Their food consists chiefly of insects and small seeds. They frequent the margins of rivers and lakes, inundated fields, and other moist grounds. “While the crows are feeding, in moist low pastures,” says White (“Nat. Hist. of Selborne”), “broods of wagtails, white and gray, run round them, close up to their noses, and under their very bellies, availing themselves of the flies that settle on their legs, and probably feeding worms and larvæ that are roused by the trampling of their feet.” Wagtails make their nests on the ground, among moist herbage, or in stony places. Their flight is rapid and undulatory. They are natives of the temperate regions of the Old World. No species is found in America. A common British species is the **PIED W.**

(*M. Yarellii*), which is from seven to eight inches in length, the long tail included, and has prettily varied white and black plumage. It is abundant over the whole south of Europe, and is found there at all seasons of the year, which is the case also in the south of England; but in more northern regions it is only a summer visitant, as in the Orkney Islands, where it is the first of the migratory birds to depart southward, the migration taking place almost as soon as the young are able for flight. The Pied W. is incessantly in motion, jerking its tail, running quickly along the ground in quest of insects, and making short flights from place to place, chirping as it flies. It is often to be seen wading in shallow water, in pursuit of aquatic insects, and catching also small minnows when they approach the surface of the water. This species was long confounded with the WHITE W. (*M. alba*), of the continent of Europe, common from Sweden to the Mediterranean, as also in many parts of Asia, and in elevated situations in India and the north of Africa, but not a native of Britain. The two species are, however, very similar.—The GRAY W. (*M. boarula*) is bluish gray above, with the rump and lower parts yellow; a black patch on the throat in summer. It is abundant on the continent of Europe, as well as in Britain, and is commonly seen on pastures, often in close attendance on cattle or sheep, whence the French name, *bergeronette*, given to this and other species of W. of similar habits.—The YELLOW W. (*M. flava*) and the GREEN-HEADED W. (*M. Rayi*), also British species, of which the latter is the more common, belong to a sub-genus, by some regarded as a distinct genus, *Budytes*, having the hind-claw very long and sharp, and thus approaching in character to the Pipits (q. v.) or Titlarks.

WAHABIS, or Waha'bites, a recent Mohammedan sect, now dominant throughout the greater part of Arabia. The movement may be considered a puritanic reform, which seeks to purge away the innovations and corruptions introduced in the course of ages, and to bring back the doctrines and observances of Islam to the literal precepts of the Koran and of the Sunna (q. v.), or oral instructions of Mohammed himself. This purified faith the W. consider it their duty to impose at the point of the sword—in this, too, following strictly the precepts and practice of Mohammed and the first califs. The founder of the sect, Ibn-abd-ul-Wahab, was the son of an Arab sheik, or chief, and was born in Nejed or Nejd (the Central Highlands of Arabia), about the end of the 17th century. He is said to have visited various schools in the principal cities of the East, and to have lived some years in Damascus; and here he is represented as formulating the resolution to restore in its primitive shape the ruined structure of Islam. Nor was the task an easy one. Throughout the Mohammedan world, the precepts of the Koran had fallen into abeyance, more especially among the Turks; and religion was little else than a round of external ceremonies—prayers, ablutions, fastings, the worshipping of the holy sheiks or saints at their tombs, and other superstitious innovations. In Central and Eastern Arabia, where the faith of Mohammed had never taken deep root, matters were even worse. According to Palgrave, "almost every trace of Islam had long since vanished from Nejed, where the worship of the Djann (genii), under the spreading foliage of large trees, or in the cavernous recesses of Djebel Towayk, along with the invocation of the dead and sacrifices at their tombs, was blended with remnants of old Sabæan superstition, not without positive traces of the doctrines of Moseylemah and Kermut. The Koran was unread, the five daily prayers forgotten, and no one cared where Mecca lay, east or west, north or south: tilthes, ablutions, and pilgrimages were things unheard of." Central Arabia was at that time divided among a multitude of virtually independent chiefs. One of these chiefs, named Sa'ud (or Saoo'd), a young man of ardent and capacious mind, who ruled over the small territory around the stronghold of Dera'ijeh, or Dureyeh* (in Nejed), was the first important convert made by Ibn-abd-ul-Wahab after his return home; and the example of the prince was followed by his kindred and retinue. The Wahabi is said to have promised Sa'ud that if he would draw the sword in the cause of pure Islam, he would make him sole ruler of Nejed, and the first potentate in Arabia.

* Nothing is more perplexing than the orthography of Arabic proper names; every traveller spells them in a way of his own. In comparing Burckhardt, Palgrave, and Colonel Pelly, it is often difficult to identify the places and persons spoken about.

The prophecy was fulfilled, partly in Sa'nd's reign, and fully in that of his son; and the Sa'nd dynasty is at this day the chief power in the peninsula; while the descendants of Ibn-abd-ul-Wahab (who lived till 1787) continue to act as spiritual directors, though without any acknowledged authority. It was about 1746 that Sa'nd began to act as apostle militant of the new, or rather revived Islam. One after another, he subdued his heretical neighbors, offering them the alternative of conversion or extermination. Dying in 1765, he was succeeded by his son, Abd-ul-Aziz, who carried on the same policy with vigor and success. Extending his sway to Hasa (Al-Ahsa, as Colonel Pelly spells it, and anciently Hajar), and other places on the Persian Gulf, he was brought in hostile contact with the Turkish authorities of Bagdad, and from that place an expedition was sent in 1797 against the W. by way of Hasa; but it failed to penetrate into Nejed, and proved fruitless. The W. now grew bolder in their plundering excursions towards the Euphrates, and in 1801, Sa'nd, the son of Abd-ul-Aziz, led an army against the holy city of Meshed Hussein, or Kerbela, took it, massacred the greater part of the inhabitants, destroyed the tomb of Hussein, the grandson of Mohammed, and carried off the treasures. On this, a second Turkish army was sent from Bagdad against Nejed, but was routed, and the greater part slain. The conquest of Hejaz was next undertaken by the Wahabias. For two or three years, Ghalib, the ruler of Mecca, had been more and more hemmed in by neighboring chiefs who had joined the W., and now, in 1803, Sa'nd collected a large army, and defeating Ghalib in several battles, laid siege to Mecca, which, after a resistance of two or three months, surrendered at discretion. Not the slightest excess was committed, but the people had to become W.—"that is, they were obliged to pray more punctually than usual, to lay aside and conceal their fine silk dresses, and to desist from smoking in public. Heaps of Persian pipes, collected from all the houses, were burned before Sa'nd's headquarters, and the sale of tobacco forbidden."—Burckhardt.

Failing to take Jiddah, into which Ghalib had thrown himself, the Wahabi forces went northwards, and, in 1804, took Medina, where they stripped the tomb of Mohammed of its accumulated treasures, and prohibited the approach to it of all but W., as they considered the reverence paid to it by the Turks and others as idolatrous. At Medina, "the Wahabias enforced with great strictness the regular observance of prayers. The names of all the adult male inhabitants were called over in the mosque after morning, mid-day, and evening prayers, and those who did not obey the call were punished. A respectable woman, accused of having smoked the Persian pipe, was placed upon a jackass, with the pipe suspended from her neck, round which was twisted the long flexible tube of snake: in this state she was paraded through the town."—Burckhardt.

During these events, Abd-ul-Aziz had been assassinated, in the end of 1803, by a fanatical Persian, whose family had been murdered by the W. at Meshed Hussein. He was succeeded by his son, Sa'nd II., who had for some time conducted the wars, and was perhaps the ablest ruler and warrior of the dynasty. For several years after the conquest of Hejaz, he continued to extend and consolidate his power. Plundering incursions were made to the very vicinity of Bagdad, Aleppo, and Damascus; while the Wahabi sheik of Asir (lying south of Hejaz) imposed the new faith on a great part of Yemen. On the east, Sa'nd took the islands of Bahrein, annexed a part of the Persian coast on the east side of the Gulf, and exacted tribute from the sultan of Oman. This brought him into conflict with Great Britain, which sent (1808) a force, and severely chastised the Wahabi pirates that infested the commerce of the Persian Gulf.

While these external struggles were going on, several of the southern provinces of Nejed broke out in revolt, instigated mainly, perhaps, by the local chiefs, whose power, formerly independent, was now circumscribed, or altogether taken away by the central government; but the rising was speedily suppressed, and a terrible example was made of the province of Harik and the town of Hntah, which last was completely demolished, and its inhabitants (the male inhabitants were reckoned at 10,000) butchered almost to a man.

From 1802, the W. had prevented the great pilgrim caravans from reaching Mecca, both because they held the observances of the Turk and Persian hajjis to be idolatrous, and also because they were scandalised at the gross immorality and indecency which were openly practised by these pilgrims. It may easily be conceived

what horror spread through the Mohammedan world when it was told that the tomb of the Prophet had been despoiled by heretics, who prevented the faithful from performing the most sacred duty of their religion. Accordingly, the sultan of Constantinople, the acknowledged protector of Mohammedanism, as early as 1804, imposed on Mehemet Ali, the newly appointed pasha of Egypt, the task of recovering the holy cities. With the dilatoriness, however, characteristic of the East, nothing was done till 1811, when an expedition was sent against them, under the command of the pasha's son, Tâ-ân-Bey. Medina was taken by the Egyptian forces in 1812, and Mecca in the following year; and a protracted and desultory warfare, with varying success, was kept up with the W. in Hejaz and around its confines. At last, in 1818, Ibrahim Pasha (q. v.) undertook to penetrate into Central Arabia, and crush the hornets in their nest. The enterprise was facilitated by the death of Sa'ud in 1814. He was succeeded by his son Abdallah, who, though an able warrior, was less adroit in securing unity of action among the numerous tribes under his sway. It was not, however, till 1818, and after repeated conflicts, that Ibrahim succeeded in decisively breaking the Wahabi force, and capturing their capital, Deraïjeh, which was laid in ruins. Abdallah-ibn-Sa'ud was sent to Constantinople, where he and some of his ministers were beheaded (1818). Ibrahim continued some months in Arabia, consolidating his conquests throughout Nejed and the adjoining provinces. His policy was one of gentleness and conciliation towards the chiefs and common people, and of stern repression towards the fanatical religious teachers; and except among these, his name is said to be yet popular throughout Central Arabia. But the folly and tyranny of the vice-governors whom he left soon caused a general insurrection; the Egyptians had to retire to Kasim; and Turki, a son of Abdallah, was proclaimed sultan of Nejed, Riad being now chosen as the capital. Renewed expeditions were undertaken by the Egyptian commanders, driving first, Turki from his capital for a time, and then his son and successor, Faysul; instead of whom, a chieftain favorable to Egyptian rule was appointed. But soon after the death of Mehemet Ali (1849), the Egyptians gave up the struggle; Faysul was recalled from exile; and under him and his son and viceroy, Abdallah II., the Wahabi sway had become more powerful and extensive than ever. In 1870 Faysul was assassinated, and the dissensions between his two sons Abdallah and Sa'ud led to a civil war. This gave occasion to the Ottoman government to send a military force into the Persian Gulf, which occupied Hofuf, the capital of Haasa, but was unable to penetrate further into Nejed.

According to Burckhardt, there is not a single new precept in the Wahabi code. The only difference between the sect and the orthodox Turks (improperly so termed) is, "that the Wahabis rigidly follow the same laws which the others neglect, or have ceased altogether to observe. To describe, therefore, the Wahabi religion, would be to recapitulate the Mussulman faith; and to show in what points their sect differs from the Turks, would be to give a list of all the abuses of which the latter are guilty." One peculiarity of the W. is their zeal against gaudy dress—silk and gold ornaments—and tobacco. In their wars of conversion, "No Smoking" has been a kind of battle-cry. The recent traveller, Palgrave, who came into more intimate contact with the W. than Burckhardt, has a much less favorable opinion both of their doctrines and their practice. He describes their empire as "a compact and well-organized government, where centralisation is fully understood, and effectually carried out, and whose main springs and connecting links are *type and fanaticism*. It is capable of frontier extension, and hence is dangerous to its neighbors, some of whom it is even now swallowing up. Incapable of true internal progress, hostile to commerce, unfavorable to arts and even to agriculture, and in the highest degree intolerant and aggressive, it can neither better itself nor benefit others; while the order and calm which it sometimes spreads over the lands of its conquest are described in the oft-cited *Ubi solitudo facit, pacem appellat* of the Roman annalist. We may add, that its weakest point lies in family rivalries and feuds of succession, which, joined to the anti-Wahabian reaction existing far and wide throughout Arabia, may one day disintegrate and shatter the Nejdian Empire, yet not destroy it altogether. But so long as Wahabism shall prevail in the centre and uplands of Arabia, small, indeed, are the hopes of civilisation, advancement, and national prosperity for the Arab race." Colonel Pelly characterises the W. as "warlike Mohammedan Quakers."

Wahoe
Wake

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Of late years, the tenets of these puritans have taken root among the Mussulman population of India, and caused very considerable uneasiness.

The following statistical table of the W. Empire was drawn up by Palgrave, mostly from the official registers at Iliad:

Provinces.	Towns or Villages.	Population.	Military Muster.
1. Aared.....	18	110,000	6,000
2. Yemamah.....	83	140,000	4,500
3. Ilarik.....	16	45,000	3,000
4. Aflaj.....	19	14,000	1,200
5. Wadi Dowasir.....	59	100,000	4,000
6. Seley'el.....	14	30,000	1,400
7. Woshem.....	20	80,000	4,000
8. Sedeyr.....	25	14,000	5,200
9. Kasim.....	60	800,000	11,000
10. Insa.....	50	160,000	7,000
11. Kutif.....	23	100,000	
	316	1,219,000	47,800

The Bedouin populations within the territories number upwards of 70,000. A good many of the towns are large, and populous to a degree that the current notions of Central Arabia would hardly lead us to look for. The following are among those of which Palgrave estimates the population: Eynn, 10,000; Bercydah, 25,000; Oney-zah, 30,000; Toweyin, 12,000—15,000; Horeymelah, 10,000; Mejma, 10,000—12,000; Riad, the capital (which Colonel Pelly has ascertained to be in lat. 24° 33' 34", long. 46° 41' 43"), has probably about 40,000; Kharfah, 8000; Hofhuf (Al-Hufuf), 24,000. Katif (Khutif) is the most direct port of the W. dominions; and the province of Hassa in which it is situated is the richest.

To the north of Nejed and its dependencies, lies a kingdom formerly ruled over by a half-hearted ally of Faysul's, Telal, the chief of Djebel Shomer, and consisting of five provinces—Djebel Shomer, Djowf, Kheybar, Upper Kasam, Teymar—with a settled pop. of 174,000, and 166,000 Bedouins. Hayel, the capital, has a pop. of 23,000. This part of Arabia was overrun and converted during the first outbreak of Wahabi propagandism; but the conversion was only seeming, and during the interference of Egypt in Arabian matters, the country regained a kind of independency. Since the death of Telal, Ottoman interference has been attempted. The great majority of the people are averse to Wahabism. Still, the W. have numerous partisans and missionaries and spies in all the towns, and their influence is hated and feared by prince and people. Even Oman, where the new Islam is said to be still more distasteful, has been brought in some degree under the political sway of the Wahab, and pays a small yearly tribute.

Karsten Niebuhr (q. v.) is the first European writer who mentions the W.; Burckhardt, "Notes on the Bedouins and Wahabism" (1830), gives a sketch of the Wahabi doctrines and of their history down to 1815; Sir Harford Jones Brydges, for many years resident at Bagdad, to his "Account of the Transactions of His Majesty's Mission to the Court of Persia," appends a "Brief History of the Wahabism;" Mengin, "Histoire de l'Egypt sous le Gouvernement de Mohammed Ali;" Corancez, "Histoire des Wahabism," with Maps. The most recent authorities on the subject are W. G. Palgrave's "Narrative of a Year's Journey through Central and Eastern Arabia," 1862—1863 (Macmillan & Co., 1865); and "A Visit to the Wahabee Capital," by Lieut.-Col. L. Pelly, H.M., Political Resident, Persian Gulf, in "Geo. Soc. Journal," 1866.

WAHOO. See ELM.

WÄYBLINGEN, a town of Würtemberg, on the Rems, in the circle of the Neckar; pop. (1871) 3530. It usually gets the credit of having given to the family of the Hohenstaufen the title which became Italianised into Ghibellines (see GUELPHS AND GIBELLINES); but Raumer (q. v.), the historian of the Hohenstaufen dynasty,

upholds the claim of another Waiblingen in Wurtemberg, on the Kocher, in the circle of Jaxt.

WAIFS, in English Law, are goods stolen, and waived or abandoned by the felon on being pursued. The goods belong to the crown, but the owner, on doing diligence to prosecute and convict the thief, can have them again.

WAINSCOT (Sax. *wag*, a wall, and *scot* or *schot*, corresponding to Ger. *Schett*, a split or cut piece of timber—from *schetilen*, to divide; the word would thus mean wall-timber or boards), the name given to boards lining the interior walls of apartments. Such lining, usually in panels, is very common in Elizabethan architecture. The name is frequently applied to the best kind of oak-boards, from oak having been so much used for panelling.

WAIST, in a Ship, is that portion of the upper deck lying between the fore and main masts. In the larger boats are stowed, and along its gunwale the crew pile their hammocks during the day. In a steamer, the waist is much broken into by the engine-room.

WAITS (anciently spelled *Waighites*) is a name which has at successive periods of our history been given to different classes of musical watchmen. The word is one, in slightly varied forms, common in the sense of guard or watchman to all the Germanic languages. It is the German *Wacht* or *Wache*, Dutch *wagt*, Danish *vaght*, Swedish *wakt*, Scotch *wate*, and the English *watch*. How the word in the form of waits came to be exclusively applied to musical watchmen in England and Scotland, it is impossible to say. In the time of Edward IV. the waits appear to have formed a distinct class from both the watch and the minstrels. It was their duty, we learn from Rymer's "Fœdera," to pipe the watch nightly in the king's court from Michaelmas to Shrove-Thurseday four times, in the summer nights three times, and to make "the bon gayte" at every chamber-door and office, for fear of pyckeres and pillars. The waits were not confined to the court; there were musical watchmen at an early period in many provincial towns. In Exeter, a regular company existed in 1400. Beaumont and Fletcher ("Knight of the Burning Pestle") speak of the "waits of Southwark as rare fellows as any in England." The word in the provinces was afterwards sometimes applied to the town musicians, who may have represented the old waits, but who had no duties to perform as watchmen. The name was also given to the town-band or to private musicians when employed as serenaders. In this sense it is used in the "Tadler" (No. 222). The writer says that it had become so much the custom for lovers to employ the waits to help them through their courtship in Nottingham, that the ladies of that place could get no sleep, by reason of riotous lovers who infested the streets with violins and base-voils between 12 o'clock and 4 in the morning. Till recently, the waits were officially recognised in London and Westminster. In London the post of leader of the waits was purchased; in Westminster, the appointment was in the gift of the High Constable and Court of Burgesses. In 1890, a Mr Munroe obtained the post of official leader of the waits for Westminster, with the exclusive right to serenade the inhabitants, and make application for Christmas-boxes. His prerogatives were invaded by other musicians, and he prosecuted several persons before the police courts. At present in the metropolis, the waits are musicians who play during the night or early in the morning for two or three weeks before Christmas. They call afterwards at the houses of the inhabitants to ask for a Christmas-box. In Glasgow, there were waits at an early period. The magistrates still grant a certificate to a few musicians, generally blind men, who play in the streets during the night and morning for about three weeks previous to New-Year's Day. Like the London waits, they call at the houses of the inhabitants, shew their credentials, and ask a small subscription.—See Chambers's "Book of Days," vol. ii. p. 742.

WAI'TZEN, a town of Hungary, charmingly situated among vineyards, on the left bank of the Danube, 91 miles north of Pesth, on the Vienna and Pesth Railway. It is a bishop's see, contains a noble cathedral with conspicuous dome, built in 1777, and a handsome episcopal palace. Considerable wine-culture is carried on, and there are important cattle markets. Pop. (1869) 12,894.

WAKE (from the Anglo-Saxon *wæcan*, to watch) is the English equivalent of

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the ecclesiastical Vigil (q. v.). In early times the day was considered as beginning and ending at sunset; Sundays and holidays, in consequence, began not on the morning, but on the previous evening (the eve of the holiday), and worshippers then repaired to the churches for worship. The following day was spent in amusement. Each church when consecrated was dedicated to a saint, and on the anniversary of that day was kept the parish wake. In many places, there was a second wake on the birthday of the saint. On these occasions, the floor of the church was strewed with rushes and flowers, and the altar and pulpit were decked with boughs and leaves. In the churchyard, tents were erected to supply cakes and ale for the use of the crowd on the morrow, which was kept as a holiday. The second part of the festival seems to have made most impression on the popular mind, and the word wake came to be applied to it. Crowds resorted to the wakes from neighboring parishes, hawkers or merchants were attracted by the crowds, and ultimately they became mere fairs or markets, little under the influence of the church, and disgraced by scenes of indulgence and riot. In 1285, Edward I. passed a statute which forbade fairs and markets to be held in country churchyards; but it does not appear to have put an end to the evil. In 1448, Henry VI. ordained that all showing of goods and merchandise, except necessary victuals, should be discontinued on the great festivals of the church. These regulations do not seem to have been strictly enforced. An act of convocation passed in 1586, during the reign of Henry VIII., seems to have effected a more important change. It ordered the day of the dedication of the church to be kept in all parishes on the first Sunday in October, and gradually that festival ceased to be observed. The saint's-day festivals were not, however, affected, and they are still kept in many English parishes under the name of "country wakes." A *lyke-wake* or *liche-wake* is a watching of a dead body (A. S. *lic*) all night by the friends and neighbors of the deceased. The custom no doubt originated in superstitious fear either of passing the night alone with a dead body, or of its being interfered with by evil spirits. It must at all times have led to scenes ill suited to the occasion, and it now survives only among the lower classes in Ireland.—See Braud's "Popular Antiquities," by Ellis.

WAKEFIELD, an important and handsome town in the West Riding of Yorkshire, overlooking the Calder, 9 miles south of Leeds, on the Lancashire and Yorkshire Railway. The town consists of three principal and many minor streets, and among the chief buildings are the parish church, conspicuous from its lofty and elegant spire; the grammar-school, a wealthy institution, attached to which there are six exhibitions to the universities; the library and news-rooms, corn-exchange, &c. Its benevolent and scientific institutions are numerous and important. The town has long been famous for its manufactures of woollen yarn and cloths. The district around W. is agricultural, and the town is noted for its corn and cattle markets. Coal-mines are worked in the vicinity. W. returns one member to the House of Commons. Pop. (1871) 28,069.

WALACHIA. See **MOLDAVIA**.

WALCHEREN, an island in the Netherlands province of Zeeland, at the mouth of the Scheldt, contains 52,000 acres; pop. (1875) 42,503. The chief places are Middelburg, Flushing, and Vere or Campvere (q. v.). One half is meadow, the other rich arable land, well wooded to the north. Where it is not protected by natural dunes, strong dykes have been formed, that at West Kappelle being a magnificent work. The drainage-water is carried off by large canals at Middelburg and Vere. Agriculture is the principal employment. Ship-building, beer-brewing, rope-spinning, weaving, sawing wood, grinding corn, tanning leather, &c. are carried on, especially at Middelburg and Flushing. From the latter town, a railway has been constructed through West and South Beveland to Bergen-op-Zoom, joining the other continental lines. Flushing has a considerable shipping trade. The people are chiefly Protestants. In many parts are large artificial mounds, supposed to have been erected by the early inhabitants as places of refuge from high tide.

WALCHEREN EXPEDITION, one of the most disastrous military failures in the history of modern warfare, was undertaken, like that of Sir John Moore to Spain, with the view of helping the continental allies of Britain, by creating such a diversion as would prevent the concentration of Napoleon's strength, in overwhelm-

ing amount, against any one of his opponents. The expedition was planned in 1807, when Prussia, Russia, and Austria were all in arms against France; but it was not till early in the summer of 1809 (when Napoleon, who had meantime overwhelmed Prussia, and reduced Russia to neutrality, was gradually forcing Austria to succumb) that the British ministry resolved to carry it out. The plan was to send a fleet and army up the Scheldt, and attack Antwerp (the principal naval station and arsenal in the north of France), whose fortifications, though formidable, were much in need of repair, and whose garrison at the time only numbered about 2000 Invalids and coast-guards; while there were not more than 10,000 French soldiers in Holland. The expedition, after numberless needless delays, at last sailed on July 28; and, to the number of 37 men-of-war, 23 frigates, 115 sloops and gunboats, accompanied by transports, carrying about 41,000 soldiers, reached the Dutch coast on the following day. But, instead of obeying the orders of the minister of war, Lord Castlereagh, to *advance at once in force against Antwerp*, the commander-in-chief, Lord Chatham (the elder brother of Pitt), frittered away his time in the reduction of Vlissingen (Flushing), which was not effected till August 16, by which time the garrison of Antwerp had been reinforced by King Louis Bonaparte with the troops at his command (about 6000), and by detachments sent from France, which swelled the garrison, by August 20, to 15,000 men. About the end of August, Chatham, who, as a general, was a methodical incapable, "found himself prepared" to march upon Antwerp, but by this time 30,000 men, under Bernadotte, were gathered to its defence, and the English army was decimated by marsh-fever, so that success was not to be hoped for. However, it was judged right to hold possession of Walcheren, in order to compel the French to keep a strong force on the watch in Belgium, and, accordingly, 15,000 men remained to garrison the island, the rest returning to England: but the malaria proved too fatal in its ravages, and as peace had been concluded between Austria and France, this force was also recalled. Thus an excellently devised scheme, through the utter stupidity of the agent chosen by royalty to carry it out, failed in every point of consequence, and ended in a loss of 7000 men dead, and the permanent disablement of half the remainder. The failure of the Walcheren Expedition was made the occasion of furious onslaughts on the ministry in the House of Commons and in the public journals.

WALDECK-PYRMONT, formerly a sovereign principality in the north-west of Germany, consisting of the old county of Waldeck, enclosed between Westphalia, Hesse-Cassel, and Prussia, and the small county of Pyrmont, about 80 miles north of Waldeck. The form of government was a constitutional and hereditary monarchy; but since 1868, the administration has been under the control of Prussia, by which power a lieutenant-governor (Landes director) is appointed. The entire area was 493 sq. m. Pop. (1871) 56,918. The elevation of the country is greater than that of most districts of Northern Germany; and the scenery, continually alternating between mountain and valley, forest and plain, comprises scenes of much natural beauty. The two largest rivers are the Eder and Diemel, affluents of the Weser. Among the minerals found are gold, copper, iron, and lead; and mineral springs occur. Agriculture and cattle-breeding are by far the most common pursuits of the people, and with the exception of leather, no articles are manufactured to any extent. An important article of export, and one from which the prince derives a considerable portion of his revenue, is the mineral water of the Pyrmont spa.

The noble House of W., one of the oldest in Germany, formerly owned, besides their present possessions, the counties of Swalenburg and Sternberg, but lost the former in 1256, and the latter in 1299. Chief town, Arolsen, with (1871) 2381 inhabitants.

WALDENSES (Valdenses, Valdesi, Valesi, Vaudola) are a Christian community who inhabit a mountain tract on the Italian side of the Cottian Alps, south-west from Turin. The district is bounded on the n. by the Dora Ripaira, on the s. by the Po. It is enclosed on all sides by spurs of the Alps, which divide it into three valleys—that of Perosa, drained by the Clusone; that of San Martino, drained by the Germanasca; and that of Lucerna, drained by the Pellice, all tributaries of the Po. These valleys lie between France and Italy, and immediately south of the great western route into Italy by the passes of Mont Cenis and Genevre. The inhabitants are thus brought into communication with both countries; indeed, they speak a dia-

lect more closely allied to those of Dauphiné than to those of Piedmont; and they have used French as well as Italian as the language of their liturgy. The religious doctrines of the W. are now similar to those of the Reformed churches. There is a minister in each parish, called a *barbe*, and the synod is presided over by an elected *moderator*. The W. had at one time bishops, but that was when the sect was more widely spread than it now is. Much has been said of the origin of the Waldenses. Their own historians assert that the community has remained from apostolic times independent of the church of Rome, and boast that they can shew a regular apostolic succession of bishops from the earliest period of Christianity till that of the Reformation. This statement has been very generally admitted by uncritical writers, but in the light of recent investigations, would seem to be no longer tenable. Dieckhoff ("Die Waldenser im Mittelalter," Gött. 1851) and Herzog ("Die romanischen Waldenser" Halle, 1855) have submitted the early history of the W. to a critical examination; and the result to which they have come, after an examination of the manuscript records, is, that the W. had not the early origin claimed for them, and were not Protestant before the Reformation, although they entertained some opinions which, so far, were in anticipation of those held by the Reformers. They are also of the opinion that the W. do not take their name from *val*, *vallia*, a valley, as has been assumed, but from Peter Waldo of Lyon, a merchant of the 12th c., who was less the founder of a sect than the representative and leader of a wide-spread struggle against the corruptions of the clergy. The church would have tolerated Peter Waldo, as it had tolerated St Francis of Assisi, the founder of the Franciscans, and perhaps have allowed him to form a new order, had he not trenched upon ground dangerous to the hierarchy. But he had the four gospels translated, and maintained that laymen had a right to read them to the people. He exposed in this way the prevalent ignorance and immorality of the clergy, and brought down their wrath upon himself. His opinions were condemned by a general council in 1179, and he retired to the valleys of the Cottian Alps. A long series of persecutions followed, but Waldo's followers could not be forced to abandon their opinions. They continued to be known as the *Leonisti*, from the place of their origin—the Poor People of Lyon, from their voluntary penury—*Sabotati*, from the wooden shoes they wore—and *Humilitati*, on account of their humility. It was natural that a body cruelly persecuted should stand aloof from the church, and even offer armed resistance; yet we have no evidence of the manner in which the W. first became a separate community. They are now shewn to have been identical with the followers of Waldo, but they must not be confounded with the Albigenses, who were persecuted at the same period. The protest of the W. against the church of Rome only related to practical questions, that of the Albigenses related to matters of doctrine.

The W. at first seem to have spread in the upper valleys of Dauphiné and Piedmont, to which Waldo retired. They were subjected to persecutions in 1332, 1400, and 1478, and driven into many parts of Europe, where their industry and integrity were universally remarked. So widely had the sect been scattered, that it was said a traveller from Antwerp to Rome could sleep every night at the house of one of the brethren. In Bohemia, many of them had settled, and they, without forsaking their own community, joined the Hussites, Taborites, and Bohemian Brethren—a connection which led to a change in the principles of the Waldenses. They adopted the doctrines of the Reformers, and this led to more serious persecutions than any they had previously undergone. Francis I. of France, in possession of Piedmont in 1541, ordered them to be extirpated. They were massacred at various places in Dauphiné and in the valleys they still occupy, more especially at Merindol and Cabrière. Several persons who refused to abandon their faith, were burned alive, yet the sect continued to exist. In 1560, the Duke of Savoy, who had recovered possession of Piedmont, urged by Pope Paul IV., forbade the W. to exercise their faith, under the penalty of being sent to the galleys for life. The W. sent him a petition and apology for their creed, which appeared to him so plausible, that he suggested that a conference should take place between the Waldensian and Romanist divines. He was, of course, told that the proposition was monstrous, and bullied by the pope and the courts of Spain and France so effectually, that he despatched 7000 men into the valleys, who were joined by two French regiments. The W. offered a gallant resistance, but were overwhelmed by superior force. Many prisoners were burned alive,

and women and children were ruthlessly slaughtered. The duke was disgusted with these atrocities, and although denounced as no better than a heretic at Rome, granted the W. an amnesty on condition that their service should only be performed at certain places in the valleys of Lucerna and San Martino. The W. in the other districts, and especially the Marquisate of Saluzzo, were then persecuted by the Jesuits. Charles I. of England sent two embassies to the Duke of Savoy to intercede in their behalf, but without avail. Victor Amadeus I., not long after, ordered the W. of Saluzzo, under penalty of confiscation of property and death, to become Catholics; and the edict was so rigorously carried out that, in a few years, none of the sect remained in the district. Charles Emmanuel II., in 1655, directed a fresh persecution against the Waldenses. Some time before, the people of Lucerna, inflamed it is said by the discourses of Jean Leger, a popular preacher, set fire to a convent of Capuchins, and committed other excesses. An inquiry was made, and it was found that the W. had purchased property and built churches and schools in districts where no concessions had been granted them. They were ordered within 30 days to sell their property, or profess Catholicism. They resisted, under leaders named Jayor and Janavel, but they could not oppose the forces sent against them. No quarter was shewn to women and children, and atrocities were committed—more especially by the French and Irish mercenaries in the service of the duke—which, recorded by Jean Leger, were heard of with indignation in all Protestant countries. Subscriptions were made in England for those who had survived the massacre. The Swiss cantons, and the states of Holland, sent envoys to the duke. Cromwell addressed Latin letters to him, written by Milton, and also sent Sir Samuel Morland, who collected numerous manuscripts connected with the history of the W., and brought them to England with him. A convention was concluded, by which the W. were allowed again to exercise their worship. In 1685, Louis XIV. revoked the edict of Nantes, and ordered the Duke of Savoy to compel the W. to adopt Catholicism. They were accordingly commanded to emigrate or abjure their tenets within 15 days. They resisted, and were attacked by the troops of the duke on one side, and those of Louis XIV. on the other. They were overpowered, and the survivors could make no conditions. A large number were imprisoned at Turin, where many died; others were allowed to emigrate. Their whole property was confiscated, and handed over to Roman Catholic colonists. When the Prince of Orange became king of England, the W. who had settled in Switzerland resolved to return to their valleys under the guidance of Henry Arnaud, one of their pastors. In 1689, they gathered from all quarters to the rendezvous in the great forest of the Pays de Vaud. On the night of the 16th of August, they embarked on the Lake of Geneva, landed on the opposite shore, and after encountering the most determined opposition, reached the valley of San Martino, after a perilous march of thirty-one days. During the winter, a French army of 23,000 men entered their territories, and in the following summer attacked their fortifications, but were repulsed with great slaughter. Fortunately, the French and Piedmontese at this juncture quarrelled, and the latter, to secure the services of the mountaineers, granted them an amnesty. They are said to have fought not less than eighteen battles against the French, and to have lost only thirty men. This was the last persecution against the Vauds; but it was not until the reign of the present king of Italy that they were admitted to the same privileges as Roman Catholics.—See Botta, "Storia d'Italia;" Bender, "Geschichte der Waldenser" (Ulm, 1850); Morland's "Churches of Piedmont;" Gelly's "Waldensian Researches;" Munton, "Israel of the Alps" (translated, Blackie, 1857).

WALES. See the articles ENGLAND, GREAT BRITAIN, PRINCE OF WALES, and the names of the various counties, towns, &c., of the principality; also **WELSH LANGUAGE AND LITERATURE.**

WALES, NEW SOUTH. See **NEW SOUTH WALES.**

WALHA'LLA (the Hall of the Fallen, i. e., heroes. See **WALKYRIES**) is, in Northern Mythology, the name of the place of residence for the fallen in battle. This brilliant hall stood in Gladsheim (the house of joy); in front of it was the beautiful grove Glasir, the trees of which bore golden leaves. Before the hall, which was so high that its summit could scarcely be seen, a wolf was hung, as a symbol of war, over which sat an eagle; the saloon itself, ornamented with shields, and wainscoted with spears, had 540 doors, through each of which 800 of the inmates

(Einherjer) could walk abreast. For these Einherjer (i. e., the brave), who came after death to Odin, was it destined. Renowned chiefs, especially if they had desolated many countries, and wielded the blood-dripping sword far and wide, were met and welcomed by Bragi and Hermode as messengers from Odin. The hall was decorated to honor them; all the divine heroes stood up at their reception; the Walkyries tasted wine for them, which otherwise only Odin drank. All kings came to Walhalla, even when they did not die on the battle-field; in general, these joys seem to have been prepared only for those of high rank and the rich. As it was honorable to come to Walhalla with a great retinue, and to possess many treasures, the comrades of a leader who had fallen in battle killed themselves of their own free will, and in his grave were laid along with his horse and arms the treasures won in fight. Every morning, the inmates marched out at the crowing of the cock, and fought furiously with one another; but at mid-day all wounds healed, and the heroes assembled to the feast under Odin's presidency. Odin himself partook of nothing but wine; he gave the edibles to the wolves Geri and Freki, who sat beside him. The guests ate of the bacon of the boar Saurimner, and refreshed themselves with beer and mead, which flowed in abundance from the udder of the goat Heidrun; the attendant Walkyries handed them the drinking-horns, under Freyja's direction. Occasionally the hero rode by night to his grave, where the beloved Walkyrie received him; he reposed in her embrace till, night disappearing, he exclaimed: "It is time to make the horse tread on the white stair of the sky; I must travel towards the west to the bridge of heaven before the cock awakes the warriors in Walhalla." The bulk of the fallen belonged to Freyja. The boar Saurimner, of which the heroes ate, was prepared by the cook Andhrimner in the kettle Eldhrimner. *Sa* is explained as signifying water; *and*, breath or soul; *eld*, fire; *hrim*, i. e., frost, was the primitive matter of which the world was made; from the branches of the deer Elkthyrnir, standing over Walhalla, drops fell into the well Hvergelmir, from which all rivers flowed. According to this, the heroes appear to be conceived as stars or spirits of the constellations, which draw their nourishment from the elements; and Walhalla stands for heaven.

The name WALHALLA is also given to a magnificent structure erected by Ludwig I. of Bavaria (1830—1841) as a temple of fame for all Germany. He conceived the project in 1806, when the Fatherland was at its lowest point of degradation, and while he was yet crown-prince. The design of the building was by Klenze, and the chief sculptors of Germany have contributed to the execution of the plan. It stands on an eminence 250 feet above the Danube at Donauinsel, near Regensburg. The temple is of nearly the same dimensions and proportions as the Parthenon, and is built of marble. By means of statues, busts, reliefs, and tablets, the mythology and history of Germany are illustrated, and her greatest names commemorated. The undertaking is said to have cost 2,380,000 florins. The chief blemish in this splendid structure is, that a monument in honor of the German people, instead of being built in the old German style, has been made a copy of a Grecian temple.

WALKER, Rev. George, an Irish clergyman, distinguished for the part he took in the heroic defence of Londonderry against the army of James II., was born in the county of Tyrone, of English parents, in the early part of the 17th century. He was educated at the university of Glasgow, and entering the church, became rector of Donoughmore. The early life of W. was not remarkable. When the Irish army of James II. entered Ulster, and took possession of Kilmore and Coleraine, W. sought refuge in Londonderry, the head-quarters of "the Englishry" since the times of James I., when the confiscated lands of the county had been bestowed on the corporation of the city of London, and a Saxon colony, English and Scotch, had been planted there, who had converted a waste into the richest district of Ireland. The town was fortified sufficiently to protect it from the pike-armed Celtic peasantry, and it had resisted more than one attack. But it was not so defended as to oppose regular troops. Lundy, the governor, was in secret communication with the enemy, and prepared to hand over the town to them; but some of his own officers protested against this course, and the citizens, remarkable at the time for that high spirit which characterises a dominant race, and the possession of those qualities which made the soldiers of Cromwell famous, determined not to yield. The bishop, Ezekiel Hopkins, in vain inculcated the doctrine of passive obedience at a conference; he was interrupted by a lad, one of a daring band known as the "thirteen Scotch

apprentices," who called out: "A good sermon, my lord—a very good sermon; but we have no time to hear it now." A Scotch fanatic named Hawson urged the Presbyterians not to ally themselves with the enemies of the Covenant; but he was laughed at by his countrymen. The thirteen apprentices closed the city-gates, and defied the enemy. It was then that W., described as an aged clergyman who had taken refuge in the city, encouraged the townspeople to fight to the last. W. saved Lundy from the rage of the populace, and enabled him to quit the city in safety. Major Baker, who soon after died, and W. became joint-governors, aided by Captain Adam Campbell. The siege is the most memorable in British history. It began in April, and lasted till the end of July, 1690. The inhabitants were reduced to the greatest extremities by hunger, but they were sustained to the last by the rousing sermons preached to them by W. in the cathedral, and the example he and Captain Campbell set in heading rallying-parties. When the siege was raised by the English fleet entering the harbor, W. went to London. He was warmly received at court, thanked by the House of Commons, created D.D. by Oxford, and Bishop of Derry by the king. Portraits of him were in every house in England, and his triumph would have been complete had the Presbyterians not thought that their share in the defence of the city was overlooked, and provoked useless controversy. W. could not be induced to take quiet possession of his bishopric; he would head a troop at the battle of the Boyne, and he was there killed. A lofty pillar has been erected to his memory at Londonderry, and the Walker Club and the Campbell Club have kept alive to our times the recollection of the siege. W. published in 1699 "A True Account of the Siege of Londonderry."

WALKING-LEAF. See **LEAF-INSECT**.

WALKING-STICK, the popular name of many insects of the family *Phasmida* (q. v.), destitute of wings, and having a long, slender, cylindrical body, like a small stick with the bark on, the delicate legs resembling little twigs. Their habits are very similar to those of the leaf-insects or walking-leaves, and their peculiar appearance is, in like manner, their protection. Most of them are natives of warm climates, and they are widely distributed. Some of them attain a large size. *Phasma gigas*, an East Indian species, is seven or eight inches long. A species, between three and four inches long, *P. femoratum*, is found even in the northern and north-western parts of the United States.

WALKING-STICKS. The habit of using a stick, either for support or merely as a fashion, is of great antiquity; and in modern times, the supply of such articles constitutes a large branch of trade in European countries, especially in Britain, France, and Germany. The imports into London and other English ports of sticks in the raw state, to be afterwards dressed and mounted, is enormous, exceeding four and a half millions annually, and reaching a value of about £25,000. They chiefly consist of the small stems or canes of certain palms, as the Malacca cane; and others called Whangee and Penang Lawyers; the woody stems of some small species of bamboo are also used, besides straight shoots of orange, cinnamon, myrtle, and other shrubs. The preparation and sale of walking-sticks are extensively carried on in Hamburg, and the finer sorts are richly and tastefully mounted in Paris. London is, however, the greatest mart for all kinds of walking-sticks. Of British trees and shrubs, the oak, crab, hazel, and alce are used to some extent for the manufacture of walking-sticks.

WALKYRIES, beings of the Scandinavian Mythology (q. v.), the legend of whom is the most terribly beautiful in the whole system. The name is derived from the old Norse *val*, which signifies a heap of slaughtered men, and *kjora*, to choose. *Val* itself contains the notion of chosen, elect, being allied to Ger. *wahlen*, Scotch *wale*, to choose. The Walkyries, also called battle-maidens, shield-maidens, wish-maidens, are charming young women who, adorned with golden ornaments, ride through the air in brilliant armor, order battles, and distribute the death-lots according to Odin's commands. Fertilising dew drops on the ground from the manes of their horses; light streams from the points of their lances, and a flickering brightness announces their arrival in the battle. With their charming glance, they rejoice the glazing eye of the hero, and lead him to Walhalla, where they act as his cup-bearers. Two Walkyries, Hrist and Mist, are cup-bearers to Odin himself.

They differ in regard to their origin; some of them spring from Elves and other

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superhuman beings; some also are the daughters of princes, who in their lifetime are numbered among the Walkyries, shewing all their qualities, and when they die, their spirits become Walkyries. They ride generally in companies of three, or of three times three, or four times three, and have the gift of changing themselves into swans. They often choose noble heroes for lovers. Thus, Swawa was the beloved of Helgi, was twice, as Sigurum and Kara, re-born along with him, and accompanied him in his battles as a singing swan, flying over his head. Brynhild is also in the Norse heroic poem a Walkyrie. As a punishment for having distributed victory and death in battle contrary to Odin's will, he had taken the office of Walkyrie from her, and doomed her to marriage. Touched by Odin's magic rod, she lay in a trance till Sigurd, borne on his noble horse through the fire that flamed around her castle, undid her armor, and broke the spell. Whoever deprives a Walkyrie of her swan-robe, gets her into his power. Thus, three bold heroes took possession of the three princesses, Walkyries—Hladguðr Swanhwit, Herod Alvittr, and Alrun—as they sat spinning fine flax by the seaside. They stayed seven years with them, and then went away to attend on battles again as Walkyries. Here they resemble the swan-maidens of the German Sagas. But amiable as they here appear, the song of the Walkyries in the Njals Saga sounds terrible, as sitting on a hill, they weave the battle web during the battle of Sigtryg with the silken beard and King Brian of Ireland. The Walkyries were frequently confounded with the Norns or Destinies. They were also conceived under the figure of the clouds. Thus, Hrist signifies dark sky, and Mist signifies quaking. Most of the names of the Walkyries, however, relate to war and battle.

WA'LLABA TREE (*Eperua foliata*), a tree of the natural order *Leguminosæ*, sub-order *Casalpiniæ*, a native of Guiana. The wood is deep red, often variegated with whitish streaks, hard, heavy, shining, resinous, and very durable. The leaves are plumate, without a terminal leaflet; the flowers in panicles of numerous distinct racemes, on a long pendulous flower-stalk. The calyx consists of four sepals, connected into a tube at the base; the corolla of one roundish petal.

WALLACE, William, the famous Scottish patriot, was the younger son of a knight of good family in the south-west of Scotland. Neither the date nor the place of his birth has been ascertained; but there is no doubt that the former may be assigned to the middle of the reign of Alexander III. Nothing certain is known of his education or his early years. Blind Harry's half-fabulous poem has indeed inseparably associated his birth with Ellerslie, his boyhood with Dundee, and his youthful manhood with Ayreshire; but his true history, even in the next generation, was so obscure, that it is now impossible to separate truth from falsehood or exaggeration. He first appears, in the light of authentic history, as the chief of a band of insurgents against Edward, king of England. Taking advantage of his superior power, of his influence over the barons of Norman race, who then were the foremost persons among the nobility of Scotland, and of the position of umpire to which he had been chosen by the various claimants to the Scottish crown, Edward had established his supremacy over the northern kingdom, and afterwards deposed John Balliol, and attempted to govern in his own absolute right. See SCOTLAND, *History*. The injustice of the claim, and the cruelty with which it was enforced, roused the opposition of all classes in Scotland except the higher nobles. The gentry and the middle and lower classes of the Lowlands, had for many years identified themselves with the country in which they dwelt, rather than with the great English race from which most of them drew their descent; and what has been called the War of Independence began, which resulted in the deliverance of Scotland from foreign rule, at the cost of the comparative civilisation and tranquillity which the country had enjoyed under the descendants of Malcolm Canmore. In this struggle, W. was the most successful leader; and in the course of the year 1297, the insurrection became general. Edward himself was at that time in Flanders; but his general in Scotland, the Earl of Surrey, led his army to Stirling. On the 11th of September, they encountered the Scots under W., and were completely defeated. The whole kingdom submitted to W.; who, passing the Border, ravaged Cumberland and Northumberland without opposition. On his return from this expedition, he was elected by his countrymen Governor of Scotland, in name of King John, whose title was still recognised. In the following year, Edward in person entered Scotland at the head of a numerous army. He was met

at Falkirk (q. v.) by W. on 22d July; but the Scots were defeated. It is generally assumed that the jealousy of some Scottish nobles, who envied the position of the governor, had aided in bringing about the disaster, and W., in consequence resigned his high office. With this event, his brilliant public career may be said to have terminated. All that is certainly known is, that he continued to struggle for his country's independence, and never made his submission to Edward, or took those oaths of fealty to him which were so lightly made by the Scottish nobles, and as recklessly broken. The events of this period related by modern writers under the name of "Lives of Wallace," are either transactions in which there is no evidence that he took any part, or the doubtful legends which, as years went on, gathered round the name of the Scottish hero. Some documents of undoubted authenticity make it probable that he was for some time in France. The close of his life forms an exception to this obscurity. When Edward offered pardon to the other Scottish leaders on certain terms, W. was excepted by name. If he chose to surrender he might do so, but it was to be without conditions, and his life was to be at the king's mercy. Efforts were also made to discover his retreat and secure his person, and these were finally successful. In the year 1305, he was seized by some of his own countrymen, and delivered to Edward. He was carried to London, and with a mockery of the forms of justice, tried for treason. He denied the charge, asserting, with truth, that he had never been the vassal or subject of Edward; but his plea was disregarded. He was condemned and executed on the 22d of August; and his death was accompanied by acts of barbarity uncommon even in that age, and marking the merciless character which distinguished the later years of the English king. Contradictory as are the accounts of the English and Scottish chroniclers, it is not difficult to discover the true character of Wallace. He was the true leader of a national insurrection against a foreign yoke. The cruelties inflicted in his invasion of England are undeniable, but he did what he could to mitigate them; and he should not be severely blamed if, under far greater provocation, he tolerated what the good King David, in his War of the Standard, was unable to prevent. His memory lives, and will ever live in the hearts of his countrymen, who know that they owe to him and to those who followed in the same course, that their history has not been as unhappy as the history of Ireland. The chief authority for the life of Wallace, as told by popular Scotch writers, is the poem of Henry the Minstrel, who lived, however, nearly two centuries after his hero, and whose narrative is an almost unbroken series of picturesque impossibilities. The fullest modern account is that given by Mr Tytler in the first volume of his "History of Scotland," and in his *Life of Wallace* in the first volume of his "Scottish Worthies;" but Tytler is to a large extent *Blind Harry* over again, with judicious excisions. All that is really known of W. will be found in Mr Burton's "History of Scotland," and it is satisfactory to know that the result of a careful examination of the real facts by a writer so impartial, and so little apt to be carried away by enthusiasm, corroborates the most favorable estimate of W.'s character.

WALLACE, William Vincent, a British musician and composer of operas, was born at Waterford, of Scotch parents, June 1, 1814. He early attained proficiency as a performer on the pianoforte and violin—his performances on the latter instrument bringing him under the notice of Paganini. After being for some years leader of the orchestra of a Dublin theatre, he emigrated to Australia, where he lived for a considerable time in the bush, and then suddenly appeared in Sydney as a musician, and gave concerts in Australia, New Zealand, India, and America. In 1845, he came to England, and wrote his first opera, "Maritana," which was an immediate success both in London and Vienna, and still holds the stage as one of the most popular of English operas. "Matilda of Hungary" followed it in 1847. During a sojourn of some years in Germany, Wallace added further to his musical culture; and after again visiting America, composed "Lurline," which was brought out in London in 1860, with even greater success than "Maritana." In 1861, he produced "The Amber Witch;" in 1862, "Love's Triumph;" and in 1863, "The Desert Flower." W. died at the Château de Bagen, in the south of France, 19th October 1865, leaving another opera, "Estrella," nearly completed. Without possessing genius of the very first order, W. was a highly-cultivated musician; the freshness of the motives, and the brilliancy of the orchestration of his operas, particularly "Maritana" and

"Lurline," have stamped their author as one of the chief English composers of this century.

WALLENSTEIN (or, more correctly, Waldstein), Albert-Wenceslas-Eusebius von, Duke of Friedland, Sagan, and Mecklenburg, the most remarkable of the long series of eminent men who owe their prominence on history's page to the Thirty Years' War, was the third son of a noble though not wealthy Bohemian family, and was born at the château of Hermance, in Bohemia, 18th September, 1633. His parents, who were Protestants, intrusted the care of his education to the Moravian brotherhood of Koschumberg, who, however, made little of their stubborn and passionate pupil. On his parents' death, his uncle, Albert Slavata, a zealous Catholic, took charge of the wayward youth, and having won him over to his own creed, sent him to the Jesuit *convictorium* at Olmütz, and to the universities of Altorf, Bologna, and Padua, where his education, such as it was, was completed. W.'s course of training had not eradicated, or even moderated the prominent faults in his natural disposition; on the contrary, his wilfulness and independent spirit had gathered stability and strength from ineffective opposition; and his first prominent appearance on the stage of events showed a man of extreme individuality, gifted with great and versatile ability, but equally remarkable for obstinacy, passion, and pride. He afterwards visited Germany, France, and Holland, took service in the imperial army, then engaged with the Turks in Hungary, and, returning home at the close of the war (1666), married an aged widow of noble rank, who, at her death (1614), left him the whole of her great wealth. This, along with the fourteen domains bequeathed to him by his uncle, made him one of the richest and most influential lords of Bohemia, a position recognised by the imperial court by the bestowal on him of the title of count and the military grade of colonel. A second marriage in 1617 with the daughter of Count Harrach, the emperor's favorite, and W.'s firm adherence to the imperial side during the Bohemian insurrection; his maintenance, at his own expense, of a large body of troops; and his brilliant and well-directed gallantry at the battle of Prague, and in various contests with Mansfeld and Bethlem Gabor, added a powerful influence at court to his hitherto only local eminence. The latter, however, was now much increased by his purchase, at much less than their value, of sixty confiscated lordships in Bohemia; and Ferdinand II. felt himself impelled to recompense the valuable services of his faithful subject by (1628) raising him to the dignity of a prince of the empire, with the title of *Duke of Friedland*. (Friedland is a town situated close to the Prussian frontier, about 60 miles north-north-east of Prague.) Two years after, when the impossibility of maintaining an army sufficient to restrain the Protestant League from uniting with the Danes against him, threw the emperor almost into despair, W., seizing such a favorable opportunity of gratifying his ambition, offered to raise, equip, and maintain 50,000 men free of charge, provided he were intrusted with the absolute command, and allowed to appoint his own officers: a proposal greedily accepted by the emperor. W. raised 30,000 in Bohemia; adventurers from all quarters flocked to his standard; and in a short time his army far exceeded the promised number. With this motley but not ill-disciplined army, he then marched into North Germany, and acting in concert with Tilly (q. v.), routed Mansfeld at Dessau, hunted him through Silesia and Moravia, and on his junction with the army of Bethlem Gabor in Hungary, compelled, by skillful strategy, the combined forces to remain on the defensive. Released by a truce with the Transylvanian prince and the death of Mansfeld, he returned by Silesia, recovered the fortresses which Thuru had captured, forced the Elector of Brandenburg to submit to the emperor, and joined Tilly in annihilating the military power of Denmark. The value of these services to the emperor's cause was incalculable, as Ferdinand well knew, and he accordingly turned a deaf ear to the loud complaints of the North Germans, who had suffered grievously from the rapacity, oppression, and licence which W.'s soldiers were allowed to exercise without the slightest opposition; and rewarded their leader by the gift of the Mecklenburg duchies, the rank of generalissimo on land, and admiral of the Baltic. W. speedily made himself master of his new territory; fitted out a fleet of 15 sail, by the aid of which he captured Usedom and Rugen, with various Baltic ports, and laid siege to Stralsund. But the Danes annihilated his navy; and the Swedes succored Stralsund, the siege of which he abandoned in despair. But as under cover of the dread inspired by W.'s arms, Ferdinand had resumed his tyrannical and aggres-

sive schemes (see THIRTY YEARS WAR) in Germany, the Catholic League, headed by the Duke of Bavaria, became bitter adversaries of W., and backed by the intrigues of France (which was represented at Vienna by Father Joseph, a master of subtle and unscrupulous diplomacy), partly forced and partly cajoled the emperor to displace W., an act for the probable consequences of which even Ferdinand, with his extraordinary fortitude, trembled. W., however, disappointed his sovereign's fears and his enemies' hopes by obeying with apparent cheerfulness, being somewhat moved thereto by the predictions of his favorite astrologer,* who declared his star to be only temporarily eclipsed, and that it would soon shine forth again with far greater lustre; and retired to Prague, where he lived in his magnificent palace in sovereign state, surrounded by a court composed of barons, knights, and the principle officers of his army. But the insult and injury he had received were eating into his soul; the frankness and affability to his subordinates, which had hitherto distinguished him, were changed for a gloomy taciturnity; and much of his time was spent in solitude, brooding over his wrongs, and scheming for revenge on the Duke of Bavaria, whom he justly accused of being the cause of his disgrace; though all the while he kept a calm but eager watch over the changes of opinion in the court of Vienna, where several of the ministers and numerous secret agents were either in his pay, or devoted to his interests. His eminent services, his immense popularity, and his great talents, pointed him out as the only hope of the empire after Tilly's death, and Ferdinand saw himself forced almost to kneel to his haughty subject, and beseech him again to gird on his sword; but W. for a long time affected the utmost indifference to re-engaging in active service, and at last consented only on such conditions as made him the independent ruler of the empire in military affairs. With the Swedes on the Danube, the Saxons in Bohemia, and the army of the League almost annihilated, the emperor had no choice; and W., three months afterwards, was at the head of 40,000 men, well armed and disciplined. But commands and entreaties were in vain employed to induce him to save Bavaria from the Swedes; and he lay idle at Leitmeritz, gloating over the pangs of his enemy, till, on Austria being threatened, he advanced to Eger, and by menacing at once Saxony and Nuremberg, brought Gustavus to a standstill. The two armies lay opposite each other for ten weeks, each suffering the extremities of famine, hardship, and sickness, in the hope of wearying out the other. At last, when half their numbers had succumbed, Gustavus, who had made a fruitless attempt to storm W.'s camp, retreated to the Danube, whence his skilful opponent soon drew him by marching on Saxony. The two again confronted each other at Lutzen (q. v.), and though W. was completely defeated, it was chiefly owing to the superior discipline and *morale* of his opponents. His army was recruited and reorganised in Bohemia; and, unable to make head against Saxons and Swedes combined, he found it advisable to gain time by amusing his antagonists with illusory negotiations, after repeated vain endeavors to persuade the emperor to come to terms with the Protestant princes. Meantime his old enemies of the League were in full activity at Vienna; and the emperor, chagrined at the humiliations to which he had subjected himself to gain W.'s aid, was not slow to give credit, real or feigned, to their misrepresentations; his ill-concealed dislike was developed into hatred by the stubborn pertinacity with which W. insisted on the full observance of the terms of their agreement; and on W., who was kept well informed of the state of matters at court, attempting to attach his officers permanently to himself by obtaining their signatures (January 19) to an agreement to that effect, the emperor (January 24, 1634) declared him a rebel, and ordered two of his old officers, Piccolomini and Gallas, who had for some time been acting as spies on his actions, to take him dead or alive. W., with some devoted adherents, including a guard of 300 dragoons, took refuge in Eger, but was there assassinated, February 25, 1634. W. was tall, thin, and wiry, with lively brilliant eyes, tawny-reddish hair, and an unhealthy-looking, yellow complexion. "He was far superior to his sovereign in true policy, liberality of sentiment, and religious toleration; but these

* W., during his attendance at the Italian universities, had deeply studied astrology; and although far too much has been made of this fact by his biographers, there is no doubt that the mystic doctrines of this pseudo-science had a strong hold on his mind, and at times much influenced his conduct.

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qualities only rendered him more obnoxious to the bigoted emperor and his ministers." As a general, he holds the foremost rank, vigilance and presence of mind, great judgment and unflinching perseverance, being his prominent characteristics; and of him alone can it be said that he checked the progress and foiled the designs of the great hero of Sweden. After his death, it was soon that the treacherous murder of one who had twice saved the empire from destruction called for some justification; and accordingly a paper was published by imperial authority, in which an attempt was made, by misrepresenting every overture he had made to his opponents, and every scheme he had employed to divide his numerous enemies at court, to prove that he had constantly mediated treason from the time of his first disgrace. This view and its opposite have found numerous and enthusiastic supporters; but without going further into detail, we may observe that the overtures made by him to the Swedes and Saxons while in command were undoubtedly *ruses de guerre*, and were invariably found to be such by his opponents; that when the Saxons invaded Bohemia, and took Prague, where he was residing in disgrace at the time, he took no part on either side, except such measures as an influential citizen would adopt for the safety of the inhabitants from insult and spoliation; and lastly, that when, after he had been declared a rebel, he did make "treasonable" overtures to Bernhard of Weimar, the latter, though W.'s defection would at that time have been of the utmost importance, could not convince himself that this was not another artifice; a proof that the former overtures were as above stated.—See Coxes "House of Austria;" Harte's "History of the Life of Gustavus Adolphus" (1759), in which many particulars of W.'s career are supplied from the Itinerary of Carve, the chaplain to the assassin, Devereux; Gualdo-Priorato's "Historia della Vita d'Alberico Valslain, duca di Fritland;" and Pelzel's "Geschichte der Böhmen" (Prague, 1774, 1779, and 1782).

WALLER, Edmund, celebrated as one of the refiners of English poetry, was born at Colehill, Herts, on March 2, 1604—1606. He was of an ancient and opulent family, and having passed through Eton and King's College, Cambridge, was returned to parliament, at the early age of 18, as member for Amersham, Bucks. In 1631, he married a London heiress, who died shortly afterwards; and the rich widower made suit to Lady Dorothy Sidney, eldest daughter of the Earl of Leicester, whom he poetically and perseveringly commemorated under the name of Saccharissa. Lady Dorothy, however, was inexorable: "she was not to be subdued," as Johnson says, "by the powers of verse." Meeting him in her old age, she asked the poet when he would again write verses upon her, and he ungallantly replied: "When you are as young, madam, and as handsome as you were then." In the Long Parliament, W. joined the party of Hampden (who was his cousin), and he was one of the commissioners appointed to negotiate with King Charles I. at Oxford in 1642. He was soon gained over by the royalists, and entered into a conspiracy against the dominant party in the House of Commons, for which he was fined £10,000, and banished the kingdom. His conduct on this occasion was mean and disgraceful. He not only confessed all he knew, but all that he suspected; attempted to criminate innocent persons, and humbled himself before the House of Commons in language inexpressibly abject and humiliating. After eight years' exile, spent in France and Italy, he was suffered to return to England; and he then became a supporter of the Commonwealth, and a panegyrist of Cromwell, to whom he was distantly related. When Charles II. was restored, W. was equally ready with a poetical congratulation; but his loyal strains were much inferior to those with which he had hailed the Protector; and it is said that when Charles reminded him of this fact, the poet wittily replied: "Poets, sir, succeed better in fiction than in truth." Up to his 80th year, W. continued a member of the House of Commons, delighting all parties by his wit and vivacity. He died at Beaconsfield, October 21, 1687. W. began early to write verses, and published two collections of his poems—one in 1645, and another in 1664. An edition appeared in 1711, edited by Atterbury; and one in 1739, with copious "Observations" by Fenton. Pope has enlarged the sweetness of W.'s verse. Some of his smaller pieces are characterised by infinite grace and harmony; he has also occasional dignity and striking imagery, as in the lines on Cromwell; and he is never involved or obscure; yet his rank among our poets is but a subordinate one, as he is deficient in passion, energy, and creative power.

WALLFLOWER (*Cheiranthus*), a genus of plants of the natural order *Crucifera*, having the siliques quadrangular from the prominence of the nerves on the back of the valves, the seeds in a single row in each cell, the stigma deeply 2-lobed, the lobes bent back. The flowers are in racemes. The species are annual, biennial, or perennial herbaceous plants, some of them almost shrubs. The **COMMON W.** (*C. cheiri*) is found in rocky places and on old walls in the south of Europe, and also, but less abundantly, in the middle of Europe and in Britain. In its wild state, its flowers are always yellow; but in cultivation, they exhibit a considerable diversity of colors, chiefly brown, purple, and variegated; and they attain a larger size. It is a universal favorite, on account of the delicious odor of its flowers. The varieties in cultivation are very numerous; but there are among them no marked distinctions. Double and semi-double flowers are not uncommon. The plant is perennial, but in gardens is generally treated as a biennial, although fine kinds are propagated by cuttings, which soon strike root under a hand-glass. The ordinary mode of cultivation is to sow the seed of an approved kind, and to plant out the seedlings. The flowers of *W.* have a bitter and cress-like taste, and were formerly used as a medicine.

WALLINGFORD, a small, but ancient and interesting, parliamentary and municipal borough of England, mostly in the county of Berks, and on the right bank of the Thames, 18 miles north-northwest of Reading. Of its three churches, that of St. Leonard's—rebuilt in 1849—has a Norman doorway. The earthworks with which the Romans encompassed the town, are still distinctly traceable. The diversion of the London and Oxford road from *W.* much injured the old town, and it is now a place of little consequence. The borough returns one member to the House of Commons. Pop. (1871) of municipal borough, 2972.

WALLIS, Rev. John, D.D., a very eminent English mathematician, was the eldest son of the Rev. John Wallis, incumbent of Ashford in Kent, and was born there, November 28, 1616. He was brought up with a view to the church, and was educated for his profession, to the strict exclusion of all other branches of knowledge, in accordance with the prevailing practice of the time, which was in his case carried to such an extent that even ordinary arithmetic was wholly neglected. *W.* never saw a book of arithmetic till he was 15 years old, and then only by accident. At the age of 16, he was entered at Emmanuel College, Cambridge, where at that time mathematics found no place in the course of study, being esteemed merely mechanical. After a brilliant career, he took his degree, was chosen a Fellow of Queen's, and took orders in 1640. On the outbreak of the civil war he aided with the parliament, and was of great use to his party in deciphering intercepted correspondence, an art in which like Vieta (q. v.) and Battista in Porta, he was eminent. In 1644, he was one of the secretaries of the Assembly of Divines at Westminster, holding at that time the living of St. Gabriel, Fenchurch Street; and, in the following year, he joined with other eminent men in the establishment of the meetings for mutual instruction, which, 17 years afterwards, developed into the Royal Society. It was not till 1647 that he commenced the study of mathematics; and, in 1649, he was chosen Savilian Professor of Geometry at Oxford. The rapid progress he had made in his mathematical studies was evidenced by the publication of his greatest work, the "Arithmetica Infinitorum," with a treatise on Conic Sections prefixed, in 1655. In the same year commenced his well-known controversy with Hobbes—regarding a quadrature of the circle, which the latter believed he had effected—which was continued at intervals till 1668, and was marked by the usual quaint caustic satire of the time. *W.* had, of course, the right side of the dispute; but unfortunately for posterity, his manly feeling of forbearance towards a deceased antagonist (Hobbes died in 1679) prevented him from admitting his polemical treatises into the collection of his works, which was published 1698—1699. Numerous other mathematical works, as the "Mathesis Universalis" (1657), "Commercium Epistollicum" (1668), "Cuno-Cunens" (1668), "De Proportionibus" (1668), "De Astu Maris" (1668), a treatise on Mechanics (1669, 1670, 1671), editions of the works of Horrocks (1678), of the Arsenarius and Quadrature of Archimedes (1678), and of Ptolemy's Harmonica (1680), a treatise on Algebra (1686), an edition of Aristarchus and of Pappus (1688), &c., were the products of his originality and industry. We have besides numerous minor theological works, polemical and expository, from his pen, none of which, however,

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are important enough to call for mention. Of his other works, the treatise on Logic (1687), is of the highest excellence, and even at the present day is well worthy of perusal; and his English Grammar (1653), written in Latin for the use of foreigners, has only of recent years, when the true principles of grammar are becoming better understood, received the attention it merits. About 1653, W. joined the party who were in favor of a restoration of kingly government, and his talent for deciphering was now put in practice against his former friends, an act for which he has been abused with virulent injustice. At the Restoration, he was confirmed in his professorship, was appointed keeper of the archives at Oxford, and royal chaplain. In 1692, he was consulted as to the adoption of the Gregorian Calendar, and his strong disapproval decided the government to retain the old style. He died 28th October, 1703.

It is exclusively as a mathematician that W.'s name has obtained permanently a niche in the temple of fame; though as an expositor of the cardinal doctrines of Christianity he was fully on a par with South and Sherlock; but his eminence in the former character has thrown into shade even his services as a scholar, and few at the present time remember that it was he who first edited the musical works of Ptolemy, Porphyrius, Aristarchus of Samos, and the later work of Briennius, though the manner in which these labors were effected indicates unquestionably an immense expenditure of labor, and a high degree of scholarship. His "*Arithmetica Infinitorum*" is a successful attempt to solve, by means of the summation of series to infinity, a number of the more simple problems of the calculus, such as the evaluation of all cases of $\int \sin x dx$; and, in extension, to discover the limit of $\int (a^x - ax) dx$, of which the quadrature of the circle is a particular case. There are numerous other results, which are, at the present time, considered to belong to the more advanced stages of the calculus; and, in fact, W. is another example of the strange blindness which, in full possession of a principle, neglects to suit it with a generalised form of expression. The best known of W.'s results is his formula for π , which gives

$$\frac{\pi}{4} = \frac{2.4.4.6.6.8.....}{3.3.5.5.7.7.....} \text{ad infinitum.}$$

WALLOONS, the name given to a population belonging to the great Romanic family, more especially to the French stock, and occupying the tract along the frontiers of the German-speaking territory in the South Netherlands, from Dunkirk to Malmedy. They are located more particularly in the Ardennes, in parts of the departments of Pas-de-Calais, Nord, Aisne, and Ardennes in France, but chiefly in South Brabant, as well as in the provinces of Hainaut, Namur, Liège in Belgium, and in the greater part of Luxemburg, and finally in some towns and villages in the neighborhood of Malmedy in Rhenish Prussia. The W., whose numbers in Belgium, where they are principally established, are stated at 1½ millions, are the descendants of the old Gallic Belgæ, who held their ground among the Ardennes Mountains when the rest of Gaul was overrun by the German conquerors, but became mutually Romanized, especially in their language, which appears now as a patois or popular dialect of French; of all the French dialects, however, the greatest number of Gallic words have been preserved in it. See the unfinished work by Grandgagnage, *Dictionnaire Étymologique de la Langue Wallonne* (Liège, 1845). The name W., in Dutch, *Walen*, sufficiently shows their Gallo-Romanic origin and their relationship, partly by race and partly by language, with the Galli, Gæli, Walœi, Welsh, Walachians, &c. The Walloons of the present day resemble their French more than they do their German neighbors. They are squat and middle-sized, with powerful limbs, dark hair, deep sunk, fiery, dark-brown or blue eyes. They surpass their Flemish neighbors in adroitness, activity and skill; and their French in earnestness, perseverance, and diligence. In impulsiveness they resemble the latter more than the former, but their anger sooner cools than that of the more deeply feeling Fleming. It is worthy of notice that the Belgian revolution was pre-eminently the work of the Walloon districts, and the most eminent statesman of modern Belgium are of Walloon descent. It was against the Walloon spirit and tendencies that the Flemish movement (see **FLEMISH LANGUAGE AND LITERATURE**) was chiefly directed.

WALL-PIECE, a small cannon (or, in ancient times, an arquebuss) mounted on a swivel, on the wall of a fortress, for the purpose of being fired at short-range on assailants in the ditch or on the covert-way. There are distinct evidences that the great wall of China was originally constructed for the reception of wall-pieces.

WALL-PLATE, a piece of wood laid along the top of the wall of a building to receive the feet of the rafters of the Roof (q. v.).

WALLSEND, a parish of the county of Northumberland, England, four miles east-north-east from Newcastle, celebrated for its collieries, which produce a very large quantity of coal of very superior quality. About 2,000,000 tons of W. coal are annually imported into London.

WALL-TREES, in Horticulture, are fruit-trees trained on walls for better exposure of the fruit to sunshine, and for the sake of the heat radiated from the wall. Brick walls are generally preferred, and have a great advantage in the regularity with which the nailing can be accomplished, but trees are often also trained on stone walls, and the walls of houses are sometimes used for this purpose. Trees are trained on walls in hothouses as well as in the open air. Flued walls are often used, the fruit being thus partially forced by artificial heat; and screens of various kinds, as of reeds, canvas, and oiled paper, are sometimes employed to protect blossoms in spring. Woollen nets are also much used for this purpose, and a net even with wide meshes affords much protection from spring frosts. Wall-trees, intended permanently to occupy the wall, are generally trained in the nursery with a dwarf stem only five or six inches in length, so that the branches may cover the whole wall, and no available part of it may be lost. It is usual, however, in planting to introduce *riders* alternately with the permanent wall-trees, which are grafted or budded on tall stocks, and occupy part of the wall till the other trees have become large enough to require it all for themselves. Garden-walls are generally 12 or 14 feet in height. Different modes of training wall-trees are practised, of which the principal are known as *fan training* and *horizontal training*. In the former, the branches are arranged like the spokes of a fan; in the latter a main stem is led up, from which they are spread out horizontally on both sides. Different modes are preferred for different kinds of trees, and the art of the gardener is displayed in keeping to his plan of training and *laying in* branches so as completely to fill up the space, and make every part of the wall productive. There is a Dutch mode of training, which consists in leading two chief branches horizontally to right and left, and training shoots from them straight up to the top of the wall. It is seldom employed in Britain, except for white currants. *Riders* are not unfrequently trained in a star-like form, some branches being led downwards, in order to fill the wall as quickly as possible. It is necessary for the gardener, in training wall-trees, to consider the habit of each kind, particularly whether fruit is chiefly to be expected on young branches or on the *spurs* of older branches. Superfluous branches must in all cases be carefully removed, and amongst these are to be reckoned all *fore-right shoots*, or branches which project straight from the wall. The use of small strands of cloth, along with nails, to fasten branches to walls, is familiar to every one. These strands are renewed from year to year, so that they may not cause disease, by interfering with the growth of the branches.

WALNUT (*Juglans*), a genus of beautiful trees of the natural order *Juglandaceae*. This order is nearly allied to *Amentaceae* (q. v.), and particularly to the sub-order *Cupuliferæ* (q. v.), or *Corylaceæ*, but differs in having the ovary one-celled, with a solitary erect ovule. The flowers are unisexual, the male flowers in catkins, the female in terminal clusters. The species, of which not quite thirty are known, are mostly natives of North America; a few are found in Asia. All are trees with alternate pinnated leaves. The genus *Juglans* is distinguished by monoclous flowers, with 18–24 stamens; and a drupe with a deciduous fleshy husk, which bursts irregularly, and a deeply wrinkled shell (*putamen*) of two valves, within which is the seed, curiously lobed and wrinkled, with a membranaceous *testa* and partial dissepiments. The species of Hickory (q. v.) were formerly included in this genus. —The COMMON W. (*J. regia*) is a native of Persia and the Himalaya, but has long been cultivated in all parts of the south of Europe. The date of its introduction is unknown, but it was certainly cultivated by the Romans in the reign of Tiberius. It is a lofty tree of 60–80 feet; with large spreading branches. Its foliage resembles that of the ash.

The leaves have 2-4 pair of leaflets, and a terminal one. They have a fine balsamic odor when bruised; this quality, however, being much more marked in some trees than in others. An infusion of them has been found useful in scrofula; and when bruised and rubbed on the skin, they are efficacious in curing itch. Placed in wardrobes, they prevent the ravages of moths. The sap is limpid like water, but contains much sugar, so that the tree is sometimes tapped for it, like the sugar-maple, and the sugar is procured by evaporation. A pleasant kind of wine is also made from it. An excellent pickle and a kind of ketchup are made of the unripe fruit. The ripe fruit is one of the best of nuts, and is an important article of export from many parts of the south of Europe. Walnuts are also exported in large quantities from Cashmere and other Himalayan regions to supply the markets of India. The outer husk is removed before the nuts are brought to market. In the south of Europe, walnuts are a very considerable article of food, and when perfectly fresh, they are wholesome and nutritious, although in the state in which they are imported into Britain they are not easily digestible. Just before they are ripe they are much used in France with vinegar, salt, pepper, and shallots. Among the varieties of *W.* in cultivation is one with a very thin shell, which is much esteemed. Walnuts yield by expression a bland fixed oil, which, under the names of *Walnut Oil* and *Nut Oil*, is much used by painters, and in the countries in which it is produced is a common article of food. The cake left after the expression of the oil is sometimes used as an article of food, and is also used for feeding cattle and poultry. The timber of the *W.* is of great value, and is much used by cabinetmakers. Gun-stocks are made of it. It is light, although hard and fine-grained. The wood of young trees is white and little esteemed; that of old trees is brown, veined and shaded with darker brown and black. The wood of the roots is beautifully veined. Both the root and the husks of the *W.* yield a dye, which is used for staining light-colored woods brown. The *W.*, when meant to become a timber-tree, is best sown where it is to remain, as the roots are much injured by transplanting. The best kinds of *W.* for fruit are generally grafted.—The *W.* succeeds well in Britain as an ornamental tree, even in the north of Scotland, although it seldom quite ripens its fruit except in the warmest parts of England. It was probably brought to England by the Romans. It takes its name from being foreign (*A.-S. wealh* or *wealh*).—Very similar to the Common *W.* is the *BLACK W. (J. nigra)* of North America, found in most parts of the United States, except the most northern. It is a very large and beautiful tree, the trunk sometimes six or seven feet in diameter. The leaves have more numerous leaflets than those of the Common Walnut. The timber is even more valuable than that of the Common *W.*, and is used for the same purposes. The fruit, however, is very inferior, although it is sold in the markets of American cities. The partial dissepiments of the kernel are thick and woody.—The *BUTTER NUT (J. cinerea)* is abundant in the northern and north-western states of North America, and in Canada. It is a tree only about 50 feet high, with trunk about a foot in diameter; leaves with 15-17 leaflets; the fruit elongated, and externally covered with a viscid substance. The nut is hard and rough, with prominent ridges, of good quality, and sometimes brought to market in America. The wood is not apt to split or warp, and is useful for many purposes. Sugar is obtained from the sap, as from that of the maple, but is of inferior quality. The inner bark is a mild cathartic, resembling rhubarb in its properties. The leaves, reduced to powder, are used for blistering, like cantharides.—To the natural order *Juglandaceæ* belongs the genus *Engelhardtia*, found in the Malayan Archipelago and the Himalaya. The wood of *E. Roxburghiana*, a Himalayan species, is much valued by turners.

WALPOLE, Sir Robert, third son of Robert Walpole, M.P., by Mary, daughter of Sir Jeffrey Burwell, was born August 26, 1676, at Houghton, in Norfolk. He received his education at Eton and at King's College, Cambridge. On July 30, 1700, he married Catharine, daughter of Sir John Shorter, Lord Mayor of London. On 25th November following, he succeeded to the family estates on the death of his father. In 1702, he was elected member of parliament for King's Lynn; and in 1705, he was nominated one of the council to Prince George of Denmark. In this latter capacity, he appears to have won the esteem of Godolphin, Marlborough, and other Whig leaders. In 1707, he was appointed Secretary at War; and in 1709, Treasurer of the Navy. Shortly after this, however, his fortunes suffered a temporary eclipse. He was found guilty by the House of Commons of "a high breach of

trust and notorious corruption," and accordingly, on January 17, 1712, he was expelled the House, and sent to the Tower. There can be little doubt that he had all his life a profound faith in bribery, and never scrupled to exercise it; but his punishment on this occasion seems rather to have been the result of party animosity than of virtuous indignation on the part of the House. He had all along been a strong Hanoverian, and on the accession of George I., he was restored to fortune. He was made a privy-councillor, and had various other high offices conferred upon him. On the impeachment of Bolingbroke and others by his means, he became, in 1715, Chancellor of the Exchequer, and First Lord of the Treasury. A disunion of the cabinet having arisen in 1717, he resigned office, bringing in a Stinking-fund Bill on the day of his resignation. In opposition, he was the determined enemy of the South Sea Scheme. He was recalled to office on the retirement of the Earl of Sunderland in 1721; and from this time to his final retirement in 1742, the life of W. may be said to be the History of England. In 1723, his son was created Baron Walpole. In 1727, his power was a good deal shaken by the disputes which had arisen between the king and the Prince of Wales; the latter siding with the Opposition, which began to grow very formidable in the questions which arose about this time between England and Spain. W. was opposed to War; the grand principle of his action being, according to Archdeacon Coxe, "the love of peace;" according to Macaulay, however, his aim was not the peace of his country, but of his own administration. In 1740, a motion was made in the House to petition the king to remove Sir Robert W. "from his Majesty's presence and councils for ever." This motion was negatived by a large majority; but the power of the great minister was evidently shaken. He resigned on 2d February 1743, when he was created Earl of Orford, with a pension of £4000 a year. Charges of bribery were now brought against him, and a committee of investigation was ultimately appointed by the House of Commons. It consisted of 21 members, of whom only two were of his own party. The Report was against him, but it was unsupported by evidence, and proceedings were ultimately dropped. The rest of W.'s life was spent in tranquillity and retirement. He died in 1745, aged 63. In private life, he was amiable and good-tempered. Love of power appears to have been his ruling motive of action. He had strong common sense, with clearness of political vision, and next to his own interest he had at heart the interest of his country. Doubtless, he bribed largely, but as Macaulay says: "We might as well accuse the poor Lowland farmers who paid black-mail to Rob Roy, of corrupting the virtue of the Highlanders, as accuse Sir Robert Walpole of corrupting the virtue of parliament."—See Coxe, "Memoir of Life and Administration of Sir Robert Walpole" (Lond. 1798); and Lord Macanlay's Essay on "Walpole's Letters to Sir Horace Mann."

WALPOLE, Horace, third son of Sir Robert Walpole, first Earl of Orford, was born in 1717. He was educated at Eton and Cambridge. After finishing his education, he travelled abroad for some years, principally in Italy, where he seems to have acquired those tastes for which he afterwards became so well known. In 1741, he returned to England, and took his seat in parliament. But he had no taste for politics, and never took any active part in public life. In 1747, he purchased a piece of ground near Twickenham. Here he built his famous mansion—Strawberry Hill. Its erection and decoration may almost be said to have formed the principal occupation of his long life. In 1758, he published his "Catalogue of Royal and Noble Authors." This was followed by "The Castle of Otranto," "The Mysterious Mother," and the "Historic Doubts on the Life and Reign of Richard III." The works, however, to which he owes the preservation of his name are his "Letters." These will always be interesting as pictures and records of the society and fashionable gossip of his day. Their interest is, however, considerably marred by their palpable want of truthfulness. On the death of his nephew in 1791, he became fourth Earl of Orford. He died in his 80th year on March 2, 1797. "The faults of Horace Walpole's head and heart," says Macanlay, "are indeed sufficiently glaring. His writings, it is true, rank as high among the delicacies of intellectual epicures as the Strasburg pie among the dishes described in the 'Almanach des Gourmands.' But as the *pâté de foie gras* owes its excellence to the diseases of the wretched animal which furnishes it, and would be good for nothing if it were not made of livers preternaturally swollen, so none but an unhealthy and disorganised mind could have produced such ill-luxuries as the works of Walpole. . . . The comfort

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mation of his mind was such that whatever was little seemed to him great, and whatever was great seemed to him little. Serious business was a trifle to him, and trifles were his serious business."—See "Letters," edited by Mr Peter Cunningham (8 vols., 1857); also Macaulay's Essay on "Letters of Horace Walpole."

WALPURGA, or Walpurgis, St (otherwise *Walburga*), followed her brothers St Willibald and St Wunibald (sons of the king of the West Saxons), in the time of St Boniface, from her native country, England, to Germany, to help them in extending Christianity. Willibald established the bishopric of Eichstätt about 741; and Wunibald, the neighboring convent of Heidenheim about 745, the direction of which last W. undertook, after his death (about 763), as the first abbess, and continued till the end of her own life (778). Her bones, from which, according to the oldest biography, a miraculous healing oil flowed, were transferred to Eichstätt, where a convent was erected in her honor. That old biography was written towards the end of the 9th c. by a monk, Wolfhart, in the monastery of Ilsestried, and contained, like all the later legends, which are based solely upon it, only a multitude of marvellous stories of the usual stamp. A somewhat more special significance lies in the trait that W. was not molested by biting dogs, and was in consequence invoked for protection against them and other ferocious animals. The veneration of W. became widespread. Throughout all Germany, and even in France, the Netherlands, and England, churches and chapels were dedicated to her, relics of her were shewn, and festivals celebrated in her honor. The feast of Walpurga falls properly on the 25th of February; but as in some German calendars it is assigned to the 1st of May, the name of W. has become associated, in a quite accidental way, with some of the most noted popular superstitions. The 1st of May had been one of the most sacred days of old paganism; it was the time of a great sacrificial festival, and of the old May assembly of the people. For centuries on the 1st of May, informal courts of justice continued to be held, the joyful May procession took place, and the kindling of the sacred May-fire. See **BELTIC**. When afterwards the old heathen gods had been completely degraded into devils by the Christian missionaries, and when the belief in witchcraft had come in vogue, the Walpurgis-night obtained naturally a notorious significance, inasmuch as, during the night between the 30th of April and the first of May, the witches were held to ride on broom-sticks and hags to the old places of judgment and sacrifice, in order to enjoy themselves there with their master the devil. Such witch-hills were tolerably numerous in Germany and the neighboring countries. The best known, however, was the highest point of the Harz, the Brocken, Brocks or Blocksberg, which has obtained a wide celebrity as the scene of the witches' Sabbath in Goethe's "Faust."

WA'LRUS. See **MORSE**.

WA'LSALL, a municipal and parliamentary borough, Staffordshire, stands amid pleasing scenery on a small stream, an affluent of the Tame, eight miles north-north-west of Birmingham. Its public buildings are accounted more than usually handsome, and embrace a number of churches, a free grammar and other schools, and a number of charitable institutions. The iron manufacture, for which the situation of the town on the edge of the South Staffordshire mineral field affords facilities, is the staple branch of industry. Tanning, currying, the manufacture of harness and harness furniture, and of every description of leather goods, are extensively carried on. Coal and lime works are in operation in the vicinity, and there is an extensive trade in malt. W. returns one member to the House of Commons. Pop. (1871) 49,018.

WALSINGHAM, Sir Francis, English statesman, of an ancient Kentish family, third and youngest son of William Walsingham of Seadbury, was born at Chislehurst, Kent, in 1586. He studied at King's College, Cambridge, and afterwards travelled on the continent, where he remained until the accession of Queen Elizabeth. Burleigh, with his usual discernment in selecting men of talent, discovered his abilities, brought him into office, and sent him on an embassy to France in August 1570. He remained in Paris until April 1573, and discharged diplomatic duties with such consummate skill that he was, on the recommendation of his great patron, appointed one of the principal secretaries of state to Elizabeth. He was also sworn of the privy council, and knighted. In 1578, he was sent on an important

embassy to the Netherlands; in 1581, to France; and in 1588, to Scotland. He was, with some reason, regarded by the adherents of Mary, Queen of Scots, as the most insidious of her enemies in the English council. He contrived to intercept most of her letters, and after having deciphered them, sent them to their destination, in order to obtain fresh intelligence from their answers. Some of these deciphered letters are preserved in the British Museum. W. soon held Mary secure in the toils. Some time previous to September 1583, he had bribed to his service Chereilles, the secretary to the French ambassador Castelman, in whom Mary placed implicit confidence. W. also won over Gray, the envoy of the Duke of Guise and other friends of Mary to James VI. (James I. of England), who employed him to manage his correspondence with his mother and his friends in France. The most secret letters of Mary and of James thus came into the hands of Walsingham. Up to Babington's conspiracy, or, as some have called it, W.'s conspiracy, there was no evidence for charging Mary with being accessory to any of the plots formed against the life of Elizabeth. The real fountain-head of this conspiracy, and the chief confederates, were spies in the pay of W., and all the correspondence of Mary and her friends passed into the hands of Elizabeth's dexterous minister. After the discovery and execution of Babington, &c., W. went to Fotheringay as one of the commission to try Queen Mary. She charged him with having forged the correspondence produced against her, when W. rose in his place and solemnly called God to witness that he had not done anything unworthy of an honest man, and that he was wholly free from malice. Elizabeth signed her death-warrant with a jest on W.'s hatred of the Queen of Scots. She had ordered Davison to bring her the warrant, and when she had signed it she said: "Go; tell all this to Walsingham, who is now sick; though I fear he will die for sorrow when he hears it." W. was distinguished even among the ministers of Elizabeth for acuteness of penetration, extensive knowledge of public affairs, and profound acquaintance with human nature. His administration of foreign affairs was founded on the system of bribery, espionage, and deception. He is said to have had in his pay 58 agents and 18 spies, in various countries; and no minister was better informed of the intrigues of foreign courts. Notwithstanding this diplomatic duplicity, which was then universal among public men, W.'s personal integrity and disinterested patriotism are undoubted. He was of strict morals, favored the Puritan party, and in his later days gave himself up to religious meditation. He retired from public affairs some time before his death, and resided at his house in Barn Elms, where he died, April 6, 1590. Elizabeth was ready enough to acknowledge his diligence, genius, and important services, yet she kept him poor. There remain in the British Museum (Harleian MSS.) various letters from W. complaining of his being wholly unable, on his scanty appointments, to support his establishment, though very inadequate to his dignity of ambassador in France. Camden says he died so far in debt that he was buried privately by night in St Paul's Church, without any funeral solemnity. The queen was chary even in conferring honors upon him, for he received nothing but his knighthood, and held no offices when he resigned the charge of foreign affairs. He was married, and his daughter Frances became successively the wife of Sir Phillip Sidney, of the brilliant and unfortunate Earl of Essex, and of the brave soldier, Richard de Burgh, 4th Earl of Clanricarde.

WALTHAM, a village of Massachusetts, U. S., on Charles River and the Fitchburg Railway, ten miles north-by-west from Boston, has a broad street of handsome residences and manufactories of bleached cotton goods, hollow iron-ware, machinery, chemicals, boots and shoes, and machine-made watches, of which 10,000 are made a year. Pop. (1870) 9068; (1880) 11,712.

WALTHAM ABBEY, a market-town in the county of Essex, on the banks of the Lea, 13 miles north of the east part of London, on the Great Eastern Railway. It contains a spacious Norman church, originally belonging to an abbey. The river Lea here divides into several branches, which are made to turn a number of gunpowder and flour mills belonging to government. Enfield Lock, at which is situated the celebrated government factory for rifles, &c. (see **SMALL-ARMS FACTORIES**, ROYAL), is about a mile distant; and many of the hands there employed live in and around Waltham Abbey. A weekly newspaper is published. Pop. (1871) 5197.

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WALTHER VON DER VOGELWEIDE, the greatest and most famous Minnesinger (q. v.) of the middle ages, was born 1165—1170, in Franconia or in Austria. Although his family was noble, he had no possessions, and became a minstrel as much, perhaps, from necessity as from impulse. His master and early model was the elder Reinmar. It is thought that his first public performances in "singing and saying" date from about 1187; soon after which, he found a warm patron in Friedrich the Catholic, Duke of Austria. But this prince having died in 1198, W. began the life of a wandering minstrel, in the course of which he visited the courts of most of the German sovereigns. A few details of his career are known. He twice (1199 and 1206) spent some time at the court of the Emperor Philipp; and then lived six years at Eisenach with a generous patron, Hermann, Landgraf of Thuringia. During 1214—1218, he repeatedly visited the Emperor Otto, by whom, as well as by Philipp, he seems to have been treated with unkindly parsimony. From 1217 to 1219, he lived with Duke Bernhard in Carinthia, then returned to Austria, and in 1220 received from Friedrich II. a small estate at Würzburg. He died about the beginning of 1230. His grave has long been pointed out in the Laurence Garden of the cathedral of Würzburg; but a new monument was erected to him in 1843. W. far excelled his master Reinmar, whom he survived about 30 years, both in matter and style; while in richness and versatility of mind all the other Minnesingers must stand far behind him; for, to his wide sympathies and matured art, all themes were alike: tenderness and death, no less than cheerfulness and gaiety, deep earnestness, as well as playful raillery. He did not confine himself, like Reinmar, to *Minnelays*, but wrote also hymns, eulogies of his patrons, and didactic pieces. He sang of the duties and dignities of the emperor; of the obligations of princes and vassals; of the rights and wrongs of the question between the pope and the emperor; of the glory of the true church; and often his song conveyed earnest and cutting censure. But it was only on conviction that he gave praise or blame, never influenced by favor or prejudice; and his censures of the church were those of a candid and pious believer. From a decided patriotic feeling, he stood firmly by the empire and the emperor in opposing the pretensions and usurpations of the pope. His writings on this subject had a widespread and powerful effect; they alienated, according to the testimony of a contemporary, Thomasin, thousands from the pope, and determined the politics, so to speak, of the German poets for the whole century. W. was soon recognised by his contemporaries as the master of lyric poetry; and the traditions of the later Minnesinger schools place him among the twelve who, in the Emperor Otto the Great's time, originated and established the noble art of minstrelsy. Lachman brought out a masterly critical edition of W.'s writings (Berl. 1837, 3d ed. 1853); and Simrock an excellent translation (with explanations by Simrock and Wackernagel, 2 vols. Berl. 1838; 2d ed. Leip. 1858); Uhland wrote a beautiful account of his life and writings "W. von der Vogelweide, ein altdentscher Dichter," Stuttg. and Tüb. 1839; and Hornig, a complete *Glossarium* to his poems (Quefflinh. 1844).—See Renas, "W. von der Vogelweide" (1845); Dittis (1864); Opel (1860); Rieger (1865); Kurz (1863); and Menzel (1866).

WALTON, Isaac, author of the "Complete Angler," was the son of one Jarvis Walton, a yeoman, and was born at Stafford on 9th of August 1593. Of his earlier life not much is certainly known. In the year 1604, we find him settled in Fleet Street, London, and carrying on business there as a hosier. In the end of 1606, he married Rachel Floud, a descendant of Archbishop Crammer. From George Cranmer, her uncle, who had been a pupil and friend of Hooker, it is thought likely that W. derived much of the material for his *Life of that eminent man*. In August 1640, she died in giving birth to a daughter, having before had two sons, neither of whom survived her. In 1643, W. retired from business with such a modest competence as sufficed for the simple way of life he affected; and in 1647 he married a second time. The lady was Anne Kenn, half-sister of the well-known bishop of that name. She bore to him a daughter and two sons, only one of whom lived, and died in 1662, to the great grief of her husband, who survived her many years. He died on the 15th December 1686, at the great age of ninety, in the house of Dr Hawkins, his son-in-law, prebendary of Winchester Cathedral, and was buried in the vault of that sanctuary.

With the celebrated Dr John Donne, who died in 1631, W., who attended his

ministry, had been on terms of affectionate intimacy; and on the publication of his sermons in 1640, he was induced to preface them with a Life of the author. This, his first publication, was followed by Lives of Hooker, Sir Henry Wotton, and George Herbert, in succession; the whole four being reissued in a collected edition in 1670. In 1678, the life of his friend, Bishop Sanderson, was added. "The Complete Angler, or Contemplative Man's Recreation," was published in 1653. A *fac-simile* of the original edition was published in 1875, and, from first to last, more than fifty editions have appeared. To the edition of 1676, a little treatise on Fly-fishing was added by Walton's friend, Charles Cotton, in a fishing-house built by whom, on the banks of the river Dove, many of the later days of his happy and blameless life lapsed peacefully in the pursuit of his favorable recreation. "The Complete Angler," as a treatise on the art of angling, may be regarded as a good part obsolete, but it continues and will continue to be read for its charming simplicity of manner, its pastoral freshness and poetry, and the pure, peaceful, and pious spirit which is breathed from its quaint old pages. The Lives, though somewhat less widely known are in their kind not less exquisite and *unique*. Wordsworth has dedicated to them a beautiful sonnet, in which he speaks of the five saintly names of the subjects of them as

Satellites burning in a lucid ring
Around meek Walton's heavenly memory.

WALTZ (Ger. *Walzer*, literally, roller), a national German dance, said to have originally come from Bohemia. It first became a fashionable dance in the other countries in the early part of the 19th century. It is danced to music of $\frac{3}{4}$ time by any number of couples, who, with the gentleman's right arm round his partner's waist, wheel rapidly round on an axis of their own, advancing at the same time round the room. Some time ago the *Valse à Deux Temps* was generally adopted—a form of the waltz not so graceful as the older one, because not so correspondent to the rhythm of the music—but this has now given place to the *Valse à Trois Temps*.

WAMPUM, a name given to shells and shell-beads, used as money, and worn for ornaments in strings and belts by the North American Indians.

WANDERING JEW. See **JEW**, **THE WANDERING**.

WANDEROO', a name which has been given to several species of monkey. The species commonly described under the name is *Macacus silenus* or *Silenus veter*, a native of the coast of Malabar, a monkey of rather large size, deep black throughout, except a ruff of long gray or white hair, from the midst of which the face looks forth, and which descends over the chest, giving the animal a very peculiar aspect. This monkey exhibits considerable intelligence and docility, and performs its tricks with an absurd air of gravity.—The name W., however, more properly belongs to monkeys of the genus *Presbytes*, natives of Ceylon, to which it is given by the Sinhalese, and appears to have been transferred by mistake to the species just described, which is not found in Ceylon. The wanderoos of Ceylon are all small monkeys. The best known species is *Presbytes cephalopterus*, found in the low parts of the island. It feeds chiefly on the berries and buds of trees, and is seldom seen on the ground. Twenty or thirty are generally found together in a troop. When alarmed, they display marvellous agility in leaping, or rather swinging from branch to branch, using their powerful arms alternately, often flinging themselves obliquely so as to catch the lower bough of an opposite tree, and taking advantage of its rebound to carry them up again till they can reach a higher branch; the females all the while, being often encumbered by their young, which cling to them. This monkey is far from being so mischievous as monkeys in general. "In captivity, it is remarkable for the gravity of its demeanor, and for an air of melancholy in its expression and movements, which is completely in character with its snowy beard and venerable aspect."—Tennant's "Ceylon." Its disposition is extremely gentle and affectionate, it is intelligent and docile, and very cleanly in its habits.—Several other species of W. or *Presbytes* are found in Ceylon, some of them in the more elevated parts of the island.

WANTAGE, a market-town in Berkshire, in the Vale of the White Horse, 26 miles west of Reading, and 60 West of London. It manufactures agricultural implements, and has an extensive trade in corn. Pop. (1871) 8295.

Wapenshaw
Warbler

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WA'PENSHAW (Sax. *wæpen*, weapon, and *sceawian*, to shew), a periodical gathering of the people, instituted by various Scots statutes, for the purpose of exhibiting their arms, these statutes directing each individual to be armed on a scale proportioned to his property. There are numerous Scots acts of the 15th and 16th centuries regulating the subject of wapenshaws. In the time of war or rebellion, proclamations were issued charging all sheriffs and magistrates of burghs to direct the attendants of the respective wapenshawings to join the king's host. During the reign of the later Stuaris, attendance on the wapenshaws was enforced with considerable strictness, and in addition to military exercises, sports and pastimes were carried out by authority at these gatherings. The Covenanters, in consequence of these sports being of a kind disapproved of by them, did what they could to discourage attendance on the wapenshaws.

WA'PENTAKE (Sax. *wæpen*, arms, and *tac*, touch), a name given in Yorkshire to the territorial divisions of the county, similar to what, in most of the other counties of England are called *hundreds*, and in the more northern counties *wards*. The term has come down from Anglo-Saxon times, where it, in the first instance, signified the assemblies of each district held for the administration of justice and like purposes, at which each vassal attended armed, and "tonched" the spear of his overlord, in token of homage. From the assembly, the word was transferred to signify the district within which it was convened.

WA'PITI (*Cervus Canadensis*), a species of deer, nearly allied to the stag, but considerably exceeding it in size, being 4½ feet in height at the shoulder. It is a native of North America, found as far south as Carolina, and as far north as 56° or 57° n., lat. It is yellowish brown on the upper parts; the sides gray; a pale yellowish patch on each buttock, bounded by a black line on the thigh; the neck, a mixture of red and black, with long, coarse, black hair falling down from it in front like a dewlap; a black mark at each angle of the mouth. The hair is crisp and hard, but there is a soft down beneath it. The antlers are large, much like those of the stag, but the first branch bends down almost over the face. The W. is called *Elk* and *Grey Moose* in some parts of America, although very different from the true elk, or moose deer. It is found chiefly in low grounds, or in parts of the forest adjacent to savannahs and marshes. Its flesh is coarse and dry. The hide makes excellent leather.

WAR between states or nations, or between parties in the same state (*civil war*), is analogous to civil-law (Ger. *faustrecht*), or the law of the strongest among the individuals of a community, which is the normal state of things where no legal or fixed rights are established, or where there is no authority to enforce them. The prevalence of war among nations is thus an indication of the imperfection, or the total want, of international law. If the sentiment of brotherhood were universally diffused, and a system of international morality established and generally accepted together with an organisation for putting it in force, we can conceive the necessity for war to cease. And although the full realisation of this state of things may never be attained, it is nevertheless the ideal goal to which all real progress tends. But it by no means follows that in the present condition of the world, while the sentiment of international justice is yet in embryo, peace at any price is to be preferred to war. When a community is in a state of anarchy, the individual man must take the law into his own hands, and defend his life and his rights with violence if need be; and nations in similar circumstances must do the same. The Balance of Power (q. v.), the shape in which the sentiment of political morality in Europe seemed at one time trying to crystallise itself, has gone again apparently into chaos.

Wars are various in their occasions and objects, sometimes breaking out in consequence of disputes about territorial possessions or material interests; at other times, having reference to the establishment of some important point of civil or religious liberty. In all cases, the aim of each contending party is to weaken and overthrow the opposing party. At one time, the art of war was supposed to consist very much in wearing out the enemy by a slow process of exhaustion, and thus wars were much protracted; but more recently the greatest generals have adopted the method of rather endeavoring to strike sudden and terrible blows, by which the war is sooner brought to a termination; and this method, although it may often have been adopted

without regard to considerations of humanity, is, in all probability, less productive of suffering to mankind than the other.

Amongst rude nations, wars are conducted by tumultuary hosts, suddenly congregated, and in general, either after defeat or victory, soon dispersed. But the wars of the more civilised and powerful nations have long been conducted by armies carefully trained and disciplined; and in the case of maritime powers, by means of fleets at sea as well as of armies on land. Preparation for war amongst such nations requires not only the forming and training of the army, but vast provision in many various ways of the means and *matériel* of war. Much science and skill are also applied to the conduct of military operations, and the principles upon which they ought to be conducted have been carefully investigated, and theories tested by an examination of the history of the most important campaigns. See STRATEGY, TACTICS.

In the progress of society, certain *usages of war* have come to be generally recognised. These, of course, have varied at different times, and in different parts of the world, according to the state of civilisation and the prevalent feelings of the time: they are also subject to modification from causes less general. But the changes which have taken place in them during the lapse of ages have been in general favorable to the interests of humanity. Prisoners of war are no longer put to death, nor are they reduced to slavery, as was once very frequently the case, but their treatment has become generally more and more mild and kind. It is a well-understood rule, however, that a prisoner of war obtaining his liberty by exchange or otherwise, with the condition of not serving again during a fixed period against the same power, forfeits his life if he is found so serving and is again taken prisoner. Amongst all civilised nations, quarter is granted in battle whenever it is sought; and there are certain usages universally prevalent with regard to the capitulation of fortified places, and of bodies of troops hopelessly hemmed in by superior forces, &c.

War-cries for mutual recognition and encouragement in battle have always been common, each rude nation or tribe having its own. The ancient war-cry of the English was *Saint George!* that of the Spaniards, *San Jago!* and that of the French, *Monsieur Saint Denis!* In the fends of the middle ages, each party, or the retainers of each noble family, had a distinctive war-cry. Sometimes the war-cry was the name of the family. Thus, in Scotland, the retainers of the noble Houses of Douglas and of Home rushed into battle with the cry of *A Douglas!* *a Douglas!* or *A Home!* *a Home!* The French armies under Napoleon were accustomed to charge with shouts of *Vive l'Empereur!*

The invention of gunpowder has effected great changes in the whole art of war; but the introduction of firearms has rendered battles less sanguinary and ferocious than they previously were. Whilst firearms were yet unknown, warlike engines of various kinds were employed; but close combat was more general, and often more protracted, and the passions of the combatants had thus in ordinary battle more of that exasperation which fearfully characterises the storming of a town.

WARASDIN, capital of a county in the Austrian kingdom of Croatia, upon the right bank of the Drave, and 28 miles north-north-east of Agram. It is to some extent fortified, is surrounded by straggling suburbs, and contains nine churches, a few convents, and a gymnasium. Silk-spinning is carried on; and stoneware, wine, and tobacco are manufactured. Pop. (1866) 10,623.

WARBLER, a popular name often applied to all the birds of the family *Sylviada* (q. v.), many of which, however, commonly receive other popular names, as the Blackcap, Nightingale, Hedge-sparrow, Redbreast, Redstart, Stonechat, Wheatear, Whitethroat, &c. (q. v.), while many receive the name Warbler with some adjunct. Several British species, commonly thus designated, belong to the genus *Salicaria*, others to the genus *Sylvia*. The species of the former genus have the tail rounded; in the latter, it is almost square, or a little forked. The *Salicarias* are also inhabitants of moist situations, whence they are known as *Sedge Warblers* and *Reed Warblers*; the *Sylvias* are inhabitants of woods. Of the former genus is the GRASSHOPPER W. (*Salicaria locustella*), not unfrequent in many parts of England, and found also in the south of Scotland and in Ireland. It is found in most parts of the centre and south of Europe, at least during summer, being partially a bird of passage. It is of a greenish brown color, the centres of the feathers dark

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brown, producing a spotted appearance; the lower parts pale brown. It is a shy bird, hiding itself in hedges and bushes, but very active, often darting out like a mouse from the bottom of the hedge, and receives its name from its chirping, grasshopper-like note.—The **SEDGE W.** (*Salicaria phragmitis*) is the most common British species of *Salicaria*, and is generally found in thick patches of reeds or willows in marshes, or in other situations close to water, and where the aquatic herbage is thick and strong. It abounds on the marshy banks of the Thames. It is of a brown color, exhibiting various shades, finely intermixed; the chin and throat white; the under parts buff color.—The **REED W.** (*Salicaria arundinacea*) is found in summer in marshy situations in the south of England; it abounds in Holland and in many parts of Europe, and its range extends to the north of India. It is of a uniform pale brown, with a tinge of chestnut; the chin and throat white; the under parts pale buff color. Its nest is remarkable; it is attached to the stems of three or four reeds, and formed by winding the branches of their panicles together with a little wool; and is conical and deep, so that the eggs or young may not be shaken out when the reeds are shaken by the wind.—The **WOOD W.**, also known as **WOOD WREN** (*Sylvia sylvicola*), is common in the wooded districts of England, in summer, particularly in old plantations of oak and beech. It is olive green, tinged with yellow, the wings brown, the primaries and secondaries edged with bright yellow, the tertials with a broader edge of yellowish white; the lower parts yellow and white.—The **WILLOW W.** (*Sylvia trochilus*) is very common in the south of England in summer, but more rare in northern parts of Britain. It frequents woods, shrubberies, thick hedgerows, and bushes; but builds its nest on the ground. It is of a dull olive-green color, the wing and tail feathers dark brown, the wing-feathers edged with green; the under parts whitish, slightly tinged with yellow. The tail is slightly notched. There are other British species of more rare occurrence.—Numerous species of *W.* are found in North America, migratory birds, which spend the winter in more southern regions. Not a few of the same species are therefore reckoned among the birds of the West Indies. Some of the European species are in like manner found in Africa; and Asia has many species of *W.*, among which some of the European species are included. Australia has many species of *W.*, some of which are of very beautiful plumage.

WARBURTON, WILLIAM, a distinguished English divine, commonly known as **Bishop Warburton**, was born at Newark, in the county of Nottingham, on the 24th December 1698. He was the eldest son of George Warburton, an attorney of that place, who claimed descent from an old Cheshire family. Young *W.* received his education at the school of his native town, and afterwards at Oakham in Rutlandshire, which he left in the year 1714, returning home to pursue the profession of his father, who had died some years before. Having served the necessary apprenticeship, he practised as an attorney at Newark for some years, but with no distinguished success. His natural was bent towards literature; and he had all along expressed a desire to take orders in the Church of England. Finally, he quitted the legal profession with this object in view; and having gone through the necessary course of study, he was presented, by Sir Robert Sutton, in 1728, to the rectory of Brand-Broughton, in the diocese of Lincoln, where he remained for many years. After publishing some comparatively unimportant pieces, he issued, in 1736, a treatise, entitled "The Alliance between Church and State; or the Necessity and Equity of an Established Religion and a Test Law." This work, which is still recognised as one of the most masterly statements of the subject from the point of view of the writer, drew great and immediate attention; and in January 1787–1788, it was followed by the first volume of the *opus magnum*, on which his fame as a theologian must mainly continue to rest. This celebrated work, "The Divine Legation of Moses, demonstrated on the Principles of a Religious Deist, from the Omission of the Doctrine of a Future State of Rewards and Punishments in the Jewish Dispensation," though it encountered a storm of adverse criticism, to which the writer thought it necessary to reply in "A Vindication," &c., at once established the position of *W.* as one of the most potent intellects of the period; and though its main argument has since been extensively discredited as more or less "precarious," not the less the book, in virtue of its vast learning, its vigor, and originality, will always maintain its reputation, as one of the master-pieces of the great period of our English theology. In 1739, a new and revised edition of the first part of the work appeared. This was

followed, in 1741, by the publication of the second part; and the third and concluding section, rather supplementary to the argument than essential to it, was only given to the world after the death of the writer.

Becoming involved in the controversy which followed the appearance of Pope's "Essay on Man," W. undertook the defence of the poet, and, in 1739-1740, issued a series of seven letters, entitled "A Vindication of Mr Pope's Essay on Man, by the Author of the Divine Legation." The poet was much gratified; and between him and his vindicator a warm friendship was the result, which only terminated with the death of Pope, in 1744. He died, bequeathing to W. one-half of his library, and such profit as might accrue from any edition of his works published after his death. To Pope, W. was indebted for opportunities of cultivating the friendship of some of the most distinguished men of the time—among others, of the well-known Ralph Allen, of Prior Park, near Bath, to whose niece, Miss Gertrude Tucker, he was married in 1745.

Though W.'s important services to literature and religion were admitted, they did not for a long time bring him any very great recognition in the way of substantial preferment. On the appearance of "The Divine Legation," indeed, he had been appointed chaplain to the Prince of Wales; and in 1746, nearly ten years later, the Society of Lincoln's Inn unanimously elected him to be their preacher. In 1757, he was promoted to the deanery of Bristol; and finally, in 1760, Mr Pitt, afterwards Earl of Chatham, bestowed on him the bishopric of Gloucester, declaring that "nothing of a private nature, since he had been in office, had given him so much pleasure" as this exercise of his patronage. In the later years of his life, his mind became seriously impaired; and he was utterly prostrated by the loss of his only son, whom he did not long survive. He died on 7th June 1779.

W. was a keen polemic, and deeply engaged in all the intellectual warfare of his time. In nearly everything he wrote, there is the impress of a vigorous and fertile mind, with an arrogance of tone, which tends, in his treatment of adversaries, to degenerate into truculence and scurrility. In addition to those already mentioned, it seems sufficient to give the titles of a few of his more notable performances. In 1780, appeared his "Julian, or a Discourse concerning the Earthquake and Fiery Eruption which defeated that Emperor's Attempt to rebuild the Temple at Jerusalem," *apropos* of Dr Middleton's "Inquiry concerning the Miraculous Powers of the Christian Church." Shortly after came two volumes entitled "The Principles of Natural and Revealed Religion occasionally Opened and Explained;" and in 1755, "A View of Bolingbroke's Philosophy, in a Series of Letters to a Friend," which was held to be much the ablest of all the answers to Bolingbroke which appeared. In 1757, he attacked Hume, in a publication entitled "Remarks on Mr David Hume's Natural History of Religion, by a Gentleman of Cambridge, in a Letter to the Rev. Dr Warburton." The blind deceived no one; and if we may estimate the success of the attack by the annoyance it gave the philosopher, his allusions to "that low fellow Warburton" may be held to indicate success. In 1747, he went somewhat out of his way to issue an edition of Shakspeare, with notes critical and emendatory, which, last, though ingenious, and occasionally happy, did not greatly add to his reputation. A complete and splendid edition of his works was published in 1788, at the expense of his widow, by his friend, Bishop Hurd, who prefaced it with a biography.

WARD, Edward Matthew, R. A., an eminent painter of the present day, was born in the year 1816, in London. He early displayed a taste for art, and was educated in a way to develop it. In 1834, he was sent to study at the Royal Academy; and two years after, he went to Rome, where he remained for some time, gaining, in 1839, a silver medal, given by the Academy of St. Luke. He returned to England in 1839, making on the way a short visit to Munich, where he had lessons in fresco-painting from the celebrated Cornelius. After his return, he annually exhibited pictures at the Royal Academy, though for some years without any very decisive recognition. In 1848, he competed unsuccessfully for the decoration of Westminster Hall and the Houses of Parliament, his large cartoon specimen, "Boadicea," being generally adjudged a failure. In the same year, however, he made a very "palpable hit" by his picture, familiar to every one as engraved, "Dr Johnson perusing the manuscript of the 'Vicar of Wakefield.'" His steady progress thenceforward, in the estimation of connoisseurs and the public, is sufficiently marked by the fact, that in 1853, having

previously, as we have noted above, failed in the public competition for the work at Westminster, he was solicited by the Fine Arts Commissioners to aid in this national undertaking. Of the eight cartoons which he engaged himself to furnish, all have now been completed. The merit of these is unquestioned; and one of them in particular, "The Last Sleep of Argyll," is ranked by competent judges as one of the most masterly works in this kind which our country has as yet produced. In further recognition of his merits, Mr W. was, in 1847, elected an Associate of the Royal Academy; and in 1853, he attained the full honor of Academician. Of the works of an artist so well known, it would be idle to attempt a catalogue. A few of the more notable are: "The Fall of Clarendon," "Interview between Charles II. and Nell Gwyn," "The Royal Family of France in the Prison of the Temple," "Charlotte Corday led to Execution," "Jeannie Deans," "The Earl of Leicester and Amy Robsart," "Juliet and the Friar," "Luther's First Study of the Bible," "Baxter and Jeffreys," and "Doctor Goldsmith." In technical execution, Mr W. must be admitted a master; if he fails a little commonly, on the side of penetrative power and genuine imaginative realisation, it would be unfair to say that his failure is conspicuous.—His wife, HENRIETTA WARD, is also favorably known as a painter, and is the grand-daughter of James Ward, R. A.

WARDEN, an officer appointed for the naval or military protection of some particular district of country. In order to keep the districts of England adjoining to Scotland and Wales in an attitude of defence, great officers, called Lords Wardens of the marches, were appointed, to whom the duty of protecting the frontier was committed. From this source originated the name *ward*, applied to the subdivisions of the counties of Cumberland, Westmoreland, and Durham—a term afterwards extended to divisions of a city, town, or burgh adopted for municipal purposes. The custodian of Dover Castle was created by William the Conqueror warden of the Cinque Ports (q. v.), and guardian of the adjacent coast; an office comprising extensive jurisdiction, civil, naval, and military, the greater part of which was taken away by 16 and 19 Vict. c. 48.—As to the Lord Warden of the Stannaries, see STANNARIES.

WAR DEPARTMENT, the entire administration of the military affairs of the nation. It includes the purely military command under the **COMMANDER-IN-CHIEF**, and the civil administration under the **Surveyor-General of the Ordnance**, and the **Financial Secretary**. This latter includes the manufacture of warlike stores, and their custody; the formation of defensive works; the paying, feeding, punishing, curing, arming, carrying, &c., of the army. The National Surveys form also a part of this department. The whole department is controlled by the **Secretary of State for War**. See **WAR OFFICE**.

WARDHOLDING, the military tenure of land in Scotland under the feudal system, by which the vassal was bound to serve the superior in war whenever called on to do so. As the military duties of the vassal could not be performed when he was under age, the superior had a right both to the guardianship of his person and to the possession of his fee during his minority. An arrangement, however, was frequently made by which this right was commuted into an annual payment, in which case the fee was said to be held in *Taxed Ward*. When an unmarried vassal succeeded, the superior was entitled to a sum proportionate to the value of the estate, called the *Avail of Marriage*; and a larger sum, called the *Double Avail of Marriage*, was due when the superior named a wife for his vassal, and the vassal, rejecting her, married another woman. If a vassal alienated his lands or the larger portion of them without consent of his superior, the fee fell to the superior by what was called the casualty of *Recognition*, which was a check on vassals impoverishing themselves to such an extent as would render them unfit to perform feudal services. Ward-holding was abolished by 20 Geo. II. c. 50, as a system hazardous to the public tranquillity, such fees as were held ward of the crown being converted into *Blanch* (q. v.) holdings, and those held of subjects becoming *feu-holdings*, a yearly sum being made payable to the superior, as a recompense for the casualties which were done away with.

WARDIAN CASES, close glass cases placed upon a trough containing soil, and

accurately fitted to it, intended for the growth of plants in the windows of apartments. Remarkable success has attended the use of them even in the smoky atmosphere of the largest towns. Ferns and other plants may now be seen in great beauty and luxuriance in these cases in the windows of houses in London and in all the cities of Britain. They are especially adapted to those plants which require an atmosphere more moist than that of an inhabited apartment can ordinarily be. They derive their name from the inventor, Mr W. B. Ward of London. To the success attending them, the invention and frequent use of *vivaria* for marine animals is with great probability attributed.

WARDLAW, Ralph, D.D., the most celebrated preacher and theologian in the roll of Scotch Independents, was a Seceder by extraction, and studied in connection with the Associate Secession Church. Before he had completed his curriculum, however, he had convinced himself that congregational independency was the scriptural system of church government. In 1800, he began to preach, and after some time settled in Glasgow as pastor of an Independent church. In 1811, he was appointed Professor of Theology to the Congregational body in Scotland, in conjunction with the Rev. Greville Ewing; an office he retained, along with his pastorate, to the period of his death, which happened on the 17th December 1858. W.'s life was a very laborious and earnest one. Besides discharging faithfully and ably the duties of the pulpit and the professor's chair, he was a voluminous author, often involved in theological controversy, and a prominent actor in the public religious and philanthropical movements of the day. His intellect was acute, his understanding sound, and his style remarkable for its perspicacity, vigor, and grace. The most important of W.'s works are: "Discourses on the Socinian Controversy" (1818); "Lectures on Ecclesiastes" (2 vols. 1821); "Essays on Assurance of Faith, and on the Extent of the Atonement and Universal Pardon" (1830); "Discourses on the Sabbath" (1832); "Christian Ethics" (1833); "Discourses on the Nature and Extent of the Atonement of Christ" (1843); "The Life of Joseph and the Last Years of Jacob" (1845); "Congregational Independency" (1849); "On Miracles" (1853).—See "Life and Correspondence of Ralph Wardlaw," by Dr Alexander (1866).

WARDØEHUUS, a seaport in Norway, at the east extremity of Flinmark, stands on the island Wardøe or Vardøe, and is protected by a fort, the most northerly fortification on the globe, being in lat. 70° 22'. The inhabitants, inclusive of the garrison of 34 men, number only 190. Not even potatoes or barley comes to maturity; and the few cows that are kept have sometimes to be fed on herrings.

WARDSHIP, in English Feudal Law, was the guardianship which the feudal lord had of the land of his vassal while the latter was an infant or minor. Until the majority of the infant, the lord, out of the profits, provided a fit person to render the services incumbent on the vassal. See **TENURE**, **WARDHOLDING**.

WARE, a small market-town in Hertx, 2½ miles north-east of Hertford. Malt-ing, for which there are several establishments, most of them engaged in supplying the London breweries, is the principal employment. There is a silk mill here, employing 300 hands, and two large paper mills. In one of the lanes of the town, is still to be seen the famous Bed of Ware, for a notice of which, see **BRD.** Pop. (1871) 4917.

WAREHAM, an exceedingly ancient though small town of Dorsetshire, stands between the rivers Piddle and Frome, 14 miles nearly due east from Dorchester. It was a British town, and afterwards a Roman station, and is surrounded by a British vallum or rampart of earth, which, although extremely ancient, is still about 30 feet high, and is perfect on three sides. The chief trade is the export of potter's clay; there are also breweries, malt-houses, and brick-fields. The borough, comprising the parishes of Holy Trinity, Lady Saint Mary, Saint Martin Arne, Bere Regis, Corfe Castle, and parts of the parishes of East Stoke and Morden, sends a member to parliament. Pop. (1871) 6532.

WAREHOUSING SYSTEM is a plan for lessening the pressure of excise or customs duties by postponing payment of them until the goods they are laid on pass to the consumer, or, at all events, to the retail dealer. A merchant who might import a thousand pounds worth of wine or tobacco, if he only paid duty on it by

instalments as it went out to the dealer, would be quite unable to import so much if he had to pay somewhere from one to five thousand pounds of duty on its arrival. The system of bonded warehouses was hence adopted. The taxable commodity thus came to be locked up in a government warehouse, and the duty to be paid on its removal, along with a proportional fee or rent for the custody of the article, or its accommodation in government premises. Bonding in this manner was part of the scheme of Sir Robert Walpole in 1733, generally known as the Excise Scheme, which was defeated from its unpopularity. The system was first authorised by an act of George III. in 1802. When the customs laws were from time to time consolidated, the Warehousing Act formed a portion of the consolidation. In the consolidation of 1846, there was a separate "Act for the Warehousing of Goods." In the latest consolidation of 1855, the warehousing system is embodied in clauses 41 to 118 inclusive of the general "Customs Consolidation Act" (16 and 17 Vict. c. 107). This process, by which the crown holds in custody the goods of private persons, has produced some curious effects on mercantile law and trading practices. When transactions have taken place about bonded goods, should they be injured or destroyed, it may come to be a question of nice adjustment who is to bear the loss, seeing there is not possession to shew ownership; and still more questionable sometimes arise as to whether such goods are or are not part of a bankrupt estate. There is a difficulty in securing money upon goods without transferring their absolute possession, as in the case of pledging or pawning. The warehousing system, however, by retaining the goods for the owner, whoever he may be, has created a complete system of paper-money in the transference of the title-deeds, as they may be called, of such goods—the dock-warrants or other documents—the possession of which is equivalent to possession of the goods.

WARM-BLOODED ANIMALS. Under this title are included those vertebrates which possess a four-chambered heart and spongy lungs; the heart and lungs being so arranged that the whole of the venous or impure blood is propelled over the large but closely-packed capillary area of the lungs, by successive contractions of a special ventricle, receiving it from a distinct auricle (these being called the right or pulmonary ventricle and auricle), while the blood thus purified by the action of the air in the lungs is conveyed to another auricle, and propelled over the whole system by a second distinct ventricle (these being known as the left or systemic auricle and ventricle). The only animals which exhibit these structural peculiarities are mammals and birds. In man and in the ox, the mean temperature of the interior of the body is 104° ; in the mouse, it is 99° ; while in the whale it is 108° . In birds, it ranges, in different species, from 106° to 113° . The warm-blooded animals present, however, gradations of their heat-making power. In the hibernating animals, there is commonly a loss of heat, of from 16° to 20° , during their winter-sleep; and in the bat, the temperature falls to 49° . In the cold-blooded animals, the fishes, amphibians, and reptiles, the temperature of the blood rarely exceeds that of the surrounding medium. For the general characters of the warm-blooded animals, the reader is referred to the articles **BIRDS** and **MAMMALIA**.

WARMING AND VENTILATION. **WARMING.**—A certain temperature, constant within narrow limits, is essential for the life of warm-blooded animals, and the heat by which this temperature is maintained is produced by the vital actions of the body itself. See **ANIMAL HEAT**, **TEMPERATURE OF THE BODY**. In the case of man, however, at least in ordinary climates, and in the civilised condition, the heat of the body, if allowed freely to escape, would be dissipated faster than it is produced; and hence arises the necessity of clothing, houses, and other means of retarding its escape. To allow the body to continue depressed in temperature beyond the natural state, instead of hardening, infallibly weakens its vitality, and sows the seeds of disease; and that this error is committed on a vast scale, in Britain more especially, is apparent enough. The Reports of the Registrar-general shew that, exactly as the thermometer sinks, the rate of mortality rises and certain diseases of the most fatal kind become more prevalent; the vitality, in short, of the community decreases as the warmth of the atmosphere decreases. Could this be, if the means taken to arrest the waste of heat from our bodies, or to supplement it, were not, for the majority of men and women, insufficient, or injudiciously managed? This is a matter of literally "vital" moment to one and

all. The economy of heat is a primary element in the art of living in health and comfort; and "no knowledge of common things" that we can think of can surpass in importance a right understanding of the principles and facts on which that art rests.

Where fuel is scarce the resources against the cold of winter is thick clothing indoors as well as out. This is said to be the regular practice in China; and even in the south of Europe, fires are dispensed with in weather when we should think them absolutely necessary, and additional wrappings are considered as appropriate while sitting in the house, as in the open air. But wherever fuel can be had, it is always preferred to wear within doors much the same clothing in winter as in summer, and to keep the apartments nearly at summer temperature by artificial heat. It is this special branch of the subject, viz., the artificial warming of apartments, that we are at present to consider; and in doing so, we presume the reader to be acquainted with the more general facts regarding the generation of heat by combustion, and its diffusion, as stated in the articles COMBUSTION, FLAME, FUEL, HEAT.

The great aim, it may be premised, in all plans of warming is, as it is expressed by Dr Arnott, "to obtain everywhere on earth at will, the temperature most congenial to the human constitution, and air as pure as blows on a hill-top." The obtaining of the desired temperature would be comparatively easy by itself; the difficulty lies in combining warmth with pure air. Warming and ventilation are thus in some degree antagonistic operations, and are therefore best treated in one article. The various plans of warming hitherto tried may be classed under the four heads of—The Open Fire, Stoves, Gas, Steam and Hot Water.

The Open Fire.—The first application of artificial warmth consisted, most likely, in lighting a fire of dried sticks and leaves in a grove, a cave, or other natural shelter. When tents or wigwags came to be erected, the fire would be lighted on the middle of the floor, with perhaps a hole in the roof for the smoke to escape by. This primitive arrangement may still be seen in some of the cabins of Ireland and the Scottish Highlands. The Romans warmed their apartments chiefly by portable stoves or chafin dishes, without any regular exit for the smoke and fumes; and a brazier of charcoal is still the chief means of heating sitting-rooms in Spain and Italy, which are in general without chimneys. The Chimney (q. v.) is a modern invention.

The open coal-fire glowing in a grate, which is the prevalent mode of warming dwelling houses in Britain, has an air of cheerfulness and comfort, and a power of concentrating the whole family in one social circle, that make it almost an object of worship; but it is not without serious drawbacks, the most serious of which is the waste of fuel it occasions. About one-half of the heat produced by a common fire ascends with the smoke—the black part of the smoke itself being an unconsumed part of the fuel—while about a fourth of the heat which is radiated into the apartment is, in ordinary circumstances, carried into the chimney between the fire and the mantel-piece, and thus lost. It was calculated by Dr Arnott, that only about one-eighth part of the heat-producing power of the fuel used in common fires is realised, all the rest being dissipated into the surrounding atmosphere. A common fire gives also a partial kind of warmth, heating the side of the body next to it, but leaving the rest cold; and it produces draughts into our rooms which are anything but safe or agreeable. Notwithstanding these and other acknowledged evils, the open fire continues to hold its place, partly perhaps from prejudice, partly from real points of superiority over other methods as yet practiced; and the object of late has been, not so much to do it away, as to improve it.

Grates.—One improvement consists in diminishing the quantity of metal in immediate contact with the fuel, and forming the back and sides of the grate of fire-bricks. The bricks act like clothing, and keep in the heat of the coals, thus rendering the combustion more complete, and the fire far hotter; while iron, being a good conductor, runs away with the heat as fast as it is generated, and passes it into the wall, making the coals that touch it dull and black. The same quantity of fuel, therefore, burned in a brick-lined grate, not only produces more heat, but throws a greater proportion of that heat out into the room, and less up the flue and through the wall, than when it is surrounded by a mass of iron; for radiation depends more upon the intensity of heat than upon its quantity.

Another point deserving attention is the shape given to the chimney-mouth, or recess above the grate. When the sides are square with the back, none of the heat falling on them is given out again into the room. With a view, therefore, to throw out the heat better, the sides, or *covings*, as they are called, are inclined to the back at an angle of about 180° ; and sometimes they are made curved and of polished metal, in order that they may reflect the heat without absorbing it. It is questionable if simple brick slabs, placed at the proper angle, do not throw out more heat than the most splendid polished metal plates; for though the bricks do not reflect the rays of the fire, they become heated themselves, and then radiate their heat into the room. Plates of rough metal absorb the heat that falls upon them as the brick does; but being good conductors, the heat passes through them into the wall, and thus they never become hot enough to radiate sensibly.

Much also depends upon the shape of the fire-box, or grate itself. To see the importance of this, it is necessary to attend carefully to the exact way in which an open fire heats a room. It does so almost entirely by the rays of heat that it throws out; and these rays do not warm the air directly; they pass through it like light through glass, just as the hottest rays of the sun pass through the upper atmosphere, leaving it cold enough to freeze mercury. It is only when the rays of the fire fall on the floor, furniture, and walls of the room, that they give out their heat; and it is by coming in contact with these solid heated bodies that the air is gradually warmed. We may thus see the necessity of having a fire lighted and burning brightly for a considerable time before the hour when the apartment is expected to be comfortable.

The law that radiant heat neither affects nor is affected by the surrounding air, also explains the fact that an apartment may feel very cold, though the air in it be at high summer heat. A church or other massive stone building in frosty weather may be filled with artificially-heated air and yet retain its chilling effect for many hours. The warmth of the living body is lost in two ways: the film of colder air that touches it receives part of its heat by conduction, and rising up makes room for another film to do the same; a moderately heated body in cooling, is robbed of about half its heat in this way. The other half is given off in rays, which pass through the air, and impinge upon the objects around. These objects are radiating back heat in return; but their temperature being low, the return is small, and the warmer body is colder by the difference. Hence we are chilled by a cold wall or a cold window without touching it, and though the air between us and it may be at 70° .—To return to the shape of the grate.

The chief object is to present as large a surface as possible of glowing fire to the front. With this view, the grate is made long and deep, in proportion to its width from front to back. This principle, however, is carried too far in many grates. The stratum of fuel is too thin to burn perfectly, especially in the narrow angles at the sides, where the coals seldom get to a red heat, and are only warm enough to distil away in smoke. Such fires are constantly going out, and are further from being economical than a square box.

The practice recently come into vogue of placing grates almost on a level with the floor, is also a mistake. The floor and the lower part of the person receive no share of the radiant heat.

The chimney-throat, instead of a gulf drawing in a constant wide current of the warm air of the room, and causing draughts from windows and doors towards the fireplace, should just be sufficient to admit the burned gases and smoke that come directly from the fire, and no more. See CHIMNEY. This is the object of the movable plate in what are called *register-grates*.

It would be endless to attempt to enumerate the various forms of grate constructed, with more or less success, on the above principles. We shall content ourselves with a notice of the recent invention of the late Dr Arnott, to whom the subject of warming apartments is more indebted than to any individual since the days of Count Rumford. It comes nearer to the idea of perfection in an open fireplace than any previous contrivance. Its peculiar advantages will be understood from the following description:

Arnott's Smokeless Grate has no bottom, and below it is an iron box, open only at top, into which the charge of coal for the day—from twenty to thirty pounds—is put. Any kind of coke or coal may be used. To light the fire, the usual quantity

of wood is laid on the surface of the fresh coal, and a thickness of three or four inches of cluders or coked coal, left from the fire of the preceding day is laid over all. "The wood being then lighted, very rapidly ignites the cluder above, and at the same time the pitchy vapor from the fresh coal below, rises through the wood-flame and cluders, and becomes heated sufficiently itself to become flame, and so to augment the blaze. When the cluder is once fairly ignited, all the bitumen rising through it afterwards burns, and the fire remains smokeless."

As there is no supply of air but through the bars in front, the box being close underneath, the fire must be gradually raised up as the combustion goes on; and this is effected by having a false bottom in the box, which can be moved like a piston by means of a rod. The rod has notches in it, and, by means of the poker used as a lever, can be raised up and then retained at any height by a ratchet-catch. When the piston comes level with the bottom bar of the grate, the coals may be replenished while the fire is burning, by pushing in a flat shovel over the piston, so as to form a temporary bottom to the grate, and support the fire, while the piston is allowed to descend to the bottom. The shovel is then raised up a little in front, or a part of the upper edge of the box is made to fold down, and fresh coals are shot into the box; on which the shovel is withdrawn, and the combustion goes on as before.

"A remarkable and very valuable quality of this fire is, its tenacity of life, so to speak, or its little tendency to be extinguished." Even after it sinks below the level of the box, it does not go out, but continues to smoulder slowly for a whole day or night, and is ready to burn up actively when the piston is raised.

Another peculiarity of the Arnott grate is the means taken to diminish the proportion of the heat usually carried up the chimney. Of the thick column of smoke that issues from a common chimney-can, only a small fraction is true smoke or burned air; the rest consists of the warmest air of the room, which becomes mixed with the true smoke in the large space usually left between the top of the fire and the throat of the chimney. "The whole of the air so contaminated, and which may be in volume twenty, fifty, or even a hundred times greater than that of the true smoke, or burned air, is then all called smoke, and must all be allowed to ascend away from the room, that none of the true smoke may remain. It is evident, then, that if a cover or hood of metal be placed over a fire—or if, which is better, the space over the fire be equally contracted by brickwork, so as to prevent the diffusion of the true smoke, or the entrance of pure air from around to mix with it, except just what is necessary to burn the inflammable gases which arise with the true smoke—there will be a great economy. This is done in the new fireplace, with a saving of from one-third to one-half of the fuel required to maintain a desired temperature. In a room, the three dimensions of which are fifteen feet, thirteen feet and a half, and twelve feet, with two large windows, the coal burned to maintain a temperature of 65° in cold winter days has been eighteen pounds for nineteen hours, or less than a pound per hour."—Arnott's "Warming and Ventilation."

The hood is furnished with a throttle-valve or damper, having an external index, shewing its position, so as to give complete control over the current. The provision made for ventilation in this fireplace is considered further on.

Even in this, perhaps the most economical form of open fire yet contrived, there is still great waste of the heat actually produced by the combustion. To say nothing of what passes by conduction from the fire itself into the wall, and is mostly lost; the quantity carried off in combination with the hot gases, though no more air is allowed to enter than is necessary for complete combustion, is still great. It deserves being noticed that the proportion thus carried off is greatest in the case of fuel that burns with flame. Experiment shews that a fire of wood radiates one-quarter of its heat, the rest flying up; while the radiation from wood-charcoal is one half of the whole heat produced. Every one has felt that a *blazing* fire has far less warming effect than a glowing one. Not that flame has not intense heat in it—more intense even than a glowing fire; but it gives it out only by contact, and not by radiation. It thus appears that any mode of heating that depends upon direct radiation, as the open fireplace chiefly does, necessarily involves great waste of fuel. This can be avoided only by applying the heat on a different principle, which consists in first making the fire heat certain apparatus with considerable surface, which then, by radiation and contact with the air of the apartment, diffuses it

heat throughout it. This is the principle of the other methods of warming, which we now proceed to describe. The consideration of methods that combine the two principles, will come most conveniently last.

Warming by Stoves.—A close stove is simply an enclosure of metal, brick, or earthenware, which is heated by burning a fire within it, and then gives out its heat to the air by contact, and to surrounding objects by radiation. The simplest, and, so far as mere temperature is concerned, the most effective and economical of all warming arrangements, is what is called the Dutch stove; which is simply a hollow cylinder or other form of iron standing on the floor, close at top, and having bars near the bottom on which the fire rests. The door by which the coals are put in being kept shut, the air for combustion enters below the grate; and a pipe, issuing from near the top, carries the smoke into a flue in the wall. If this pipe is made long enough, by giving it, if necessary, one or more bends, the heated gases from the fire may be made to give out nearly all their heat into the metal before they enter the wall; and thus the whole heat of the combustion remains in the room.

The great objection to this form of stove is, that the metal is apt to become overheated, which not only gives rise to accidents, but has a hurtful effect upon the air. The exact nature of the change that highly heated metal produces upon air is not very well understood. It cannot be said to burn it, in the proper sense of the word, for none of its oxygen is abstracted, but it gives it a peculiar odor, which is both unpleasant and unwholesome. This is thought to arise in some measure at least from the hot iron burning the particles of dust that light on it, which particles consist of organic matter, such as wool, wood, &c.

Part at least of the unwholesomeness of air so heated arises from its excessive dryness; it parches and withers everything it touches, like the African simoom. It must not, however, be supposed that this is peculiar to air heated by contact with metal; *air suddenly heated is always unwholesomely dry*. This is an important point in regard to the subject of warming, and requires consideration. A cubic foot of air, say at 52°, can contain a certain quantity of moisture and no more; but if heated to 80°, it is capable of containing *five times* as much, and has thus become *thirsty*, and drinks up moisture from everything that contains any. The heating of air therefore, does not dry it, in the sense of taking moisture from it, it only renders it greedier of more; and this is equally true whether it is heated by a stove or an open fire. The chief difference is, that in the latter case the warming is more gradual, and no part of the air becomes very highly heated; while the air that touches a metal plate near redness is all at once rendered intensely thirsty, and before its fierceness is tempered by thoroughly mixing with the rest of the atmosphere of the room, must be highly pernicious. But whenever the temperature within doors is much higher than without, the air is in a too thirsty state, and parches the skin and lungs, unless means be taken to supply the necessary moisture. *An evaporating pan or other contrivance is an essential part of warming apparatus*; it is especially necessary to attend to this during east winds, which are generally too dry even at their natural temperature.

All improvements on this simple and rude form of stove aim at avoiding a high heat in the warming surface, and this chiefly by lining the fire-box with brick, and enclosing it in several casings, so as to enlarge the heated surface. A general notion of these contrivances may be got from the kind of stove called a *cockle*. The fire is burned in a small furnace within the inner case, and the air is warmed by circulating between the inner and outer cases. When placed in the apartment or hall to be warmed, the outer casing has perforations about the top for the issue of the warm air. For heating churches and similar buildings, the stove is placed in a separate furnace-room, and the warm air is conveyed to the different parts of the building in pipes or flues, while fresh air is drawn to the stove through a channel or culvert leading from outside the building to the openings in the outer casing.

The stove invented by Dr Arnott is upon the same principle of an extensive and moderately warm heating surface. Under a sense of professional honor, Dr Arnott did not take out a patent for his stove; it was therefore made by many furnishing ironmongers in the metropolis and elsewhere, some of whom took out patents for what they considered as improvements upon it. No fewer than twelve patents were taken out in one year for modifications of this stove, *all of which Dr Arnott considered to be upon false principles*. The consequence has been, that many

Arnott stoves, which had been introduced into houses, have been given up on account of the inconvenience felt from the species of heat which they generated. It is also, however, to be observed that the stove, made even upon the most approved principles, requires certain adjuncts and conditions in order to operate healthfully and agreeably.

In Russia, many parts of Germany, and other northern countries of Europe, the stoves are usually built of brick, covered with porcelain. They are of the size of a large and very high chest of drawers, and usually stand in a corner of the room. The fire is burned in a furnace near the bottom, and the heated smoke is made repeatedly to traverse the structure from side to side, along a winding passage, before it reaches the top, where a pipe conveys it, now comparatively cold, into a flue in the wall. The heated mass of brick continues to warm the room long after the fuel is burned. It is generally sufficient to warm the stove once a day. The same quantity of wood burned in an open grate would be consumed in an hour, and would hardly be felt.

Open-fire Stoves.—As a specimen of the numerous plans for combining the advantages of the stove and the open fire, we may take Sylvester's stove or grate, which is thus described in Ronald's and Richardson's "Technology:" "The fuel is placed upon a grate, the bars of which are even with the floor of the room. The sides and top of these stoves are constructed of double casings of iron, and in the sides a series of vertical plates, parallel with the front facing, are included in the interior, which collect, by conduction, a great portion of the heat generated from the fire—the mass of metal of which these are composed being so proportioned to the fuel consumed, that the whole can never rise above the temperature of 212° F. under any circumstances. The sides and top of the stove are thus converted into a hot chamber, offering an extensive surface of heated metal; at the bottom, by an opening in the ornamental part, the air is allowed to enter, and rises as it becomes warmed, traversing in its ascent the different compartments formed by the hot parallel plates, and is allowed to escape at the top by some similar opening into the room." The Sylvester stove can either be placed in an ordinary chimney recess, or be made to stand ornamentally forward into the room. The feeding-draught may be either taken directly from the apartment, or brought by flues from the outside of the building.

The idea of having an air-chamber behind and around the fireplace, from which warm air would issue into the room, thus saving part at least of the vast amount of heat that is lost by passing through the wall, is not new, having been put in practice by the Cardinal Polignac in the beginning of last century. But the way to carry the principle out to the full would be to have the open fireplace in a pier of masonry standing isolated from the wall, like a German porcelain stove. A very small fire would keep the whole mass mildly heated. The pier could receive any shape, so as to give it architectural effect; and it might either terminate in the room—the smoke, after parting with most of its heat, being conducted by a pipe into the wall—or it might be continued into the story above, where its heat would still be sufficient to warm a bedroom. An Arnott smokeless grate, set in the pedestal of an ornamental column, which might either stand in front of the wall or in a niche in its depth, might be made the *beau-ideal* of comfort, economy, and elegance.

Warming by Gas.—A prejudice arose against gas as a medium of heat, from the first attempts to employ it being made in an unskillful way. But when care is taken to carry off the products of combustion by a pipe, and to prevent overheating, gas-stoves will be found economical and pleasant, and capable of being used in situations where a common stove is inadmissible.

In stoves, gas should always be burned with the Bunsen burner, which is generally employed by chemists when they make use of gas for heating purposes. It consists of a small brass cylinder or chimney, set over the gas-jet like the glass of an argand lamp, with openings near the bottom to allow air to enter. The gas being admitted into this before lighting, mixes with the air, and when lighted at the top, which is usually covered with wire-gauze or perforated metal, burns with a pale-blue flame. The most complete combustion, and the greatest heat are obtained in this way. Smoke, properly so called, there is none. Still, it must not be forgot that there is burned air—a cubic foot of carbonic acid, besides a quantity of watery

vapor, for every cubic foot of gas used; and therefore, even with the Bursen burner, these gaseous products should, whenever it is possible, be conducted away.

A pleasant and very serviceable gas-stove might be constructed by making the casing double, to contain water. It has been ascertained that a gallon of water may be brought to the boiling-point in 20 minutes by burning 4 cubic feet of gas, which, at 4s. 6d. per 1000 feet, cost less than a farthing. The cost of doing the same by a newly-lighted coal-fire is more than threefold.

Steam and Hot Water.—The immediate warming agent in these two methods is the same as in Arnott's and other low temperature stoves—viz., an extensive metallic surface moderately heated; but instead of heating these surfaces by direct contact with the fire, the heat is first communicated to water or steam, and thence to the metal of a system of pipes. This affords great facility in distributing the heat at will over all parts of a building; and these methods are peculiarly adapted to factories, workshops, and other large establishments. Other advantages are—freedom from dust, and from all risk of overheating and ignition.

Steam.—Steam-warming is generally adopted in establishments where steam-power is used, as the same boiler and furnace serve both purposes. When steam enters a cold vessel, it is condensed into water, and at the same time gives out its latent heat till the vessel is raised to 212° , when the condensation ceases. The condensing vessel is usually a cast-iron pipe placed round the wall of the apartment near the floor. In admitting fresh air into the room it may be made to pass over this pipe, and thus be warmed. The steam is conducted from the boiler by a smaller tube, which may be covered with flint or other material, to prevent all condensation by the way; and the admission of the steam is regulated by a cock within the apartment, means being provided for allowing the air to escape. Where a pipe cannot be laid round the room, a coil of pipe may be formed, or the steam may be admitted into a large vessel or into a hollow statue, forming a steam-stove. Allowance must be made for the expansion of the tubes by heat; and they are so arranged that the condensed water is conveyed back to the boiler. One round of iron pipe, of four inches diameter, is quite sufficient to warm each of the large apartments or stories of the printing-office from which the present work issues.

There can be no proper comparison between this plan of heating and that of common fireplaces. Coal-fires cannot warm the air in large workshops; the heat is confined to their own immediate neighborhood; hence the workmen are often obliged to draw near the grate to warm themselves. According to the plan here adopted, every part of the house is equally heated, and the whole of the workmen are as comfortable during the hardest frosts as if they were working in a pleasant summer day. It is difficult to estimate the expense of supplying the heat, seeing that the steam happens to be drawn from a boiler which is always in operation for other purposes. Excellent, however, as the process is, it is for many reasons unsuited to private dwelling-houses.

In calculating how much surface of steam-pipe will be sufficient to warm a room, it is customary to allow about 1 foot square for every 6 feet of single glass window, of usual thickness; as much for every 120 feet of wall, roof, and ceiling, or ordinary material and thickness; and as much for every 6 cubic feet of hot air escaping per minute as ventilation, and replaced by cold air.

Hot Water.—Hot-water apparatus was applied as early as 1777 by M. Bonne-main, in Paris, to warm the hot-houses at the Jardin des Plantes, as well as for the artificial hatching of chickens. It was first introduced into England by the Marquis de Chabannes in 1816, and is now used in many large buildings. It is more economical than steam, except where a steam-boiler is required for machinery; and from this and other advantages, it is generally preferred to steam-apparatus. One of these advantages is, that the heat begins to be distributed, in some degree, as soon as the fire is lighted, while with steam-apparatus the whole of the water must be at boiling-heat before any steam enters the pipes.

There are two kinds of hot-water apparatus—high-pressure and low-pressure. In the first, the water is confined, and can be heated to any degree; in the other, it is open to the air, and cannot be heated above 212° . In the low-pressure method there is a boiler, from the top of which a tube issues, which after circulating through the building, re-enters near the bottom. At the top of the circuit, there is a funnel, or a small cistern, by which the tubes and boiler may be kept full. When the fire is

lighted at the bottom of the boiler, the heated portion of water, being lighter than the rest, rises towards the top through the tube, while the colder water flows in to take its place. The tube is made to traverse the apartments to be warmed, where it gives out its heat to the air; the returning portion of the pipe is thus always colder, and therefore heavier than the other, so that the circulation is constantly kept up. The warming surface is increased, wherever it is necessary, by coiling the pipe, or by making expansions upon it of various forms, so as to constitute water-stoves.

To avoid the necessity of so large a surface, and such a mass of water as is required at the low temperature the water attains in the pipes of this kind of apparatus, Mr Perkins introduced the high-pressure system. In this, the pipe is made comparatively small, but very strong, and is formed into an endless circuit cut off from the atmosphere. The water is heated by making a number of coils of the pipe itself pass through the furnace; and as the whole circuit forms a shut vessel, as it were, the temperature may be raised to 300° and upwards, according to the strength of the pipes. This high temperature causes a rapid circulation. In filling the tube with water, care is taken to expel all the air; and there is an expansion of the tube, equal to 15 or 20 per cent. of the capacity of the whole, which is left empty both of water and air, to allow for the expansion of the water when heated. The arrangement of the pipe may be various; the plan generally followed is to place a considerable coil of it within a pedestal or bunker, with open trellis-work in front, in a convenient part of the room. It may also be made to wind round the room, behind the skirting-board, which, being perforated with holes, will allow of the entrance of the warmed air.

The hot-water apparatus has been fitted up by Messrs Perkins and Heath in various public buildings, warehouses, and gentlemen's houses; and, while sufficiently effective for the desired end, it has been proved to be attended with as few drawbacks as any regulated mode of heating whatever. But there is a great obstacle to its general adoption in its expensiveness. The temperature also becomes at times so high as to cause a disagreeable odor. Another objection is its liability to burst; though, from the tubes being of malleable iron, such an accident causes more inconvenience than serious danger.

Conservation of Warmth.—The art of warming embraces not only the production and distribution of heat, but the construction of apartments with a view to prevent its escape. The way to effect this—setting aside in the meantime the necessity of renewing the air—is, in the first place, to make the walls, floor, windows, doors, &c. as impervious to air as possible, to prevent the heat from being carried off by currents; and in the next place, to make them bad conductors of heat. For this last purpose, the walls ought to be sufficiently thick, and, if possible, built of non-conducting materials. Solid iron would make a cold wall; wood, a warm one; and in this respect brick or porous stone is preferable to hard stone. But the chief element in a warm wall is that it be *double*, which every wall in effect is, when it is lined by a coating of plaster, kept apart from the wall itself by the lath. The plate of confined air between the two is the most effectual barrier to the passage of the heat outwards that could be contrived. By making iron walls double or cellular, with a lining of plaster, they might be rendered as warm as wished. Windows are a great source of cold, not merely by admitting cold air, but by allowing the heat to pass by conduction through the thin glass. The air of the room that touches the window is robbed of its warmth, and is constantly descending in a cold stream towards the floor. There is thus a cold influence felt from a window, however close it is. This is partly arrested by window-blinds, shutters, and curtains, which check the flow of the air, and retard its carrying power. But a far more effectual plan is to have double windows; either two frames, or double panes in the same frame. The loss of heat by a double window is said to be only one-fourth of that by a single. Double windows are considered essential in countries where the winters are rigorous.

By carrying those principles far enough, we might succeed in well-nigh imprisoning the heat, and thus produce a house of ideal perfection, so far as mere temperature is concerned. But for the habitation of living beings, another condition, seemingly antagonistic to the former, is no less requisite—"air as free as that on a mountain-top." In general practice, the two hostile conditions are not so much

sought to be reconciled as compromised; and then, as usual, neither object is well attained. Circulation of air is got accidentally, through the imperfections of structure in our rooms—through the chinks and bad fittings of the windows, doors, floors, and the uneconomical fashion of our fireplaces. Were houses much better constructed than they are, the inmates would in many cases be suffocated outright, as they often partially are with the degree of perfection we have already attained. Neither the airing of our houses, nor the art of building them solid and warm, can advance to perfection, until the former be no longer left to chance, but be in every case secured by special apparatus capable of direct control. We now proceed to consider how this is sought to be attained; confining ourselves still to the leading principles, and only noticing a few of the specific plans that have been put in practice.

VENTILATION.—The necessity of constantly renewing the air wherever living beings are breathing, arises chiefly from the effects produced upon air in the lungs (see **RESPIRATION**). The average quantity of carbonic acid in expired air or breath is found to be 4.3 per cent. by measure. Now this gas, when taken into the lungs, is a poison, and tends to arrest the vital processes. Like other poisons, however, it can be rendered harmless by *dilution*. The small proportion naturally existing in the atmosphere is perfectly innocuous, and may be considerably increased without sensible effect. But it is decidedly prejudicial to breathe for a long time air containing 1 measure in 100 of carbonic acid; and it is considered desirable that the proportion should never exceed 1 in 500. We may assume, then, what is near the truth, that 20 cubic feet of air pass through the lungs of a man in an hour. To reduce the poison of this to 1 per cent., at which point it is barely respirable, it requires to mingle with as much fresh air as will make a mixture of nearly 100 cubic feet; and to make the dilution at all safe, it must be carried five times as far. In other words, the respiration of one human being vitiates hourly about 500 cubic feet of air.

In addition to carbonic acid, expired air contains an undue amount of watery vapor. Minute quantities of animal matters are also exhaled with the breath, which in close ill-ventilated apartments form a clammy deposit on the furniture and walls, and, by putrefying, become organic poisons.

A further necessity for the constant renewal of fresh air arises wherever lights are burned. The deteriorated air of a fire goes off by the flue, but lights are generally burned where the products must mingle with the atmosphere of the apartment. Now, a pound of oil in burning consumes the oxygen of 13 feet of air, and produces a large amount of water in vapor, and also of carbonic acid. Every cubic foot of gas consumes the oxygen of 10 feet of air, and forms at least 1 foot of carbonic acid, besides watery vapor, sometimes mixed with sulphurous fumes.

To counteract these various sources of pollution, and keep the air sufficiently fresh and wholesome, in rooms where many persons are breathing, it is found in practice that on an average about 20 cubic feet of fresh air per minute for each individual must be supplied.

Ventilation consists of two operations—the removal of the foul air, and the introduction of fresh. Though neither operation can go on without the other going on at the same time, it is convenient to consider the two separately.

The agents employed in removing the air from apartments are chiefly two: that by which nature effects the ventilation of the earth on a grand scale, viz., the draught of ascending currents produced by difference of temperature; and mechanical force, such as pumping. The former is the more common, and is the only one applicable to private houses.

The column of air in the chimney of a lighted fireplace being expanded and comparatively light, exerts less than the prevailing pressure on the air immediately under and about its base. The air, therefore, below and around it pushes it up, and flows in to take its place; the velocity of the movement being in proportion to the height of the chimney and the degree of heat. Thus, although it is often convenient to speak of the air being *drawn* or *sucked* into the chimney, the force does not lie in the chimney, but in the greater pressure of the air behind.

Wherever, then, there is a heated chimney, there is a means of removing the foul air. And in rooms moderately lofty and spacious, with windows and other fittings not closer than usual, and a chimney-mouth of the usual width, there is little

risk, when there are only a few inmates, of any serious vitiation of the air. The heated breath that ascends to the ceiling has time to diffuse itself gradually, and be drawn in a diluted state into the currents that are setting from all quarters towards the chimney. These currents, however, are one great objection to this mode of ventilation, as they consist in great part of cold air that had just entered by the doors and windows, and are strongest where the inmates sit to enjoy the fire.

The ascent of foul air to the top of the room dictates its exit in that direction, rather than low down at the mouth of the chimney. It is conceived by some that the carbonic acid of the breath, from its greater weight, must be chiefly at the bottom of the room; but this is a mistake. The heated breath ascends instantly, because it is, as a whole, lighter than the air around it; and the carbonic acid in it does not tend to separate from it and fall down by its superior weight, but, by the law of the diffusion of gases, seeks to spread itself equally all over the room, and would do so though it were lying at first on the floor. It is on the principle of the foul air ascending at first to the top of a room, that Dr Arnott's ventilating-valve is contrived. The valve may be used to supplement the open-fire draught in small and crowded apartments, and is essential where the fire is burned in a close stove or in the smokeless grate. An aperture is cut in the wall over the chimney, as near to the ceiling of the apartment as may be convenient. In this is suspended a valve, capable of opening inward to the chimney, but not in the other direction, by which means a return of smoke is prevented. The valve is so balanced on its centre of motion, that it settles in the closed position, but is easily opened. A flap of 86 square inches is sufficient, where there is good chimney-draught, for a full-sized room with company. This simple apparatus may be paluted or otherwise made ornamental. It operates by virtue of the draught in the chimney. Whenever that is active, from the presence of a fire, the valve is seen to open inwards, and a stream of air from the top of the apartment passes through into the chimney, and is carried off. The operation is precisely equivalent to the stream of air always passing into a chimney between the fire and the mantel-piece, but has the great superiority of draining off the most impure air in the room. A wire descends to a screw or peg fixed in the wall, by which the opening of the valve may be limited or altogether prevented. This is a far more efficient plan of ventilation than an open window, or an opening in the wall near the roof, leading merely to the outer air; where there is an open fire in the room, such openings rather admit a rush of cold air than let out the foul.

There is generally more or less draught in a chimney even without a fire, from the air within being slightly warmer than that without; and this action might be strengthened by burning a jet of gas within the ventilating aperture. Where a house is to be built new, some recommend having special ventilating-flues in the walls, separate from, but close to the fire-flues, so that the air may be heated, and an ascending current produced. In weather when fires are not required, the draught can be maintained by gas-jets at the entrances to the vents. This plan of causing a draught by gas is applicable to churches and apartments without fire-places.

Where a fire is burned for the express purpose of producing a current of air, it is called ventilation by *fire-draught*. The plan has been exemplified with success in mines, where a fire being lighted at the bottom of a shaft, air is drawn off in all directions around, and sent up the shaft; to replace which, fresh air is constantly pouring down other shafts.

Many of our large buildings are ventilated by fire-draught. This is an arrangement by which a school or church may be ventilated: the flooring is performed with holes, through which air, warmed by hot-water pipes, passes to the interior. The ceiling is perforated, leading to a chamber which communicates with a vertical flue; which leads to the fireplace of the warming apparatus, situated at the foot of a flue, a constant current is thus maintained through the apertures in the ceiling. Dr Reid exemplified this method, first in his own class-room in Edinburgh, and afterwards in various public buildings, among others, in the temporary House of Commons, erected after the burning of the old house in 1834. The plan was attended with some inconveniences—in fact, no plan can meet every contingency—but, notwithstanding the storm of hostile criticism that was raised at the time, Professor Tomlinson ("Treatise on Warming and Ventilation," 1864) gives it as his opinion that, "in the case of the temporary House of Commons, where all the arrangements were left in his own hands, he succeeded in the proposed object of removing the

vitiated air, and keeping up a constant supply of warm or of cool air to fill its place." The arrangements for warming and ventilating the present House of Commons are a modification of Dr Reid's plan.

In other cases, as at the prison in Millbank, warm air is admitted at the ceiling, and carried off by the draught of a chimney in connection with the sides or lower part of the rooms.

In these last-mentioned instances, the apparatus provides as well for the admission as for the removal of air. In ordinary dwellings, no special provision is in general made as to admission. It is, in fact, not absolutely necessary; for the removal of a portion of the air of a room never fails to secure the entrance of a fresh supply somewhere. Whenever the chimney-draught or other means removes a little of the pressure inside the room, the pressure without forces air through every opening and chink; and even, were there no actual openings, would force it through the porous substance of the structure—such as mortar, and even wood itself. But this irregular source of supply has various inconveniences. It often requires more force to strain the air in this manner than the draught is possessed of, and then the chimney smokes; it is smoke produced by this cause that is curable by opening the door or window. Another objection is, that impure air is often thus drawn into rooms from the lower parts of the building and from drains about the foundation. For these and other reasons, there ought, in all cases, to be a free and legitimate entrance provided for fresh air, so as to give a control over it; and this entrance should be independent of the windows. It is a much disputed point whereabout in a room the air should be made to enter—some advocating openings for it near the floor, others near the ceiling; and it must be confessed that neither method has yet been rendered unobjectionable. One essential thing is, to prevent the air from rushing in with a strong current, by passing it through minute holes spread over a large space. A tube, for instance, leads from the outer air to a channel behind the skirting, or behind the cornice, and the air is allowed to issue into the room through minute holes, or through a long, narrow, and concealed opening covered with perforated zinc or wire-gauze. The passage or tube leading from outside the wall can be more or less closed by a valve regulated from the inside.

But the great difficulty lies in the coldness of the air directly introduced from the outside, whether by the doors and windows, or through channels in the walls; and all such plans of ventilation must be considered as imperfect make-shifts. The fresh air ought in every case to be warmed before being admitted, or, at least, before being allowed to circulate in a sitting-room. In the smokeless grate the air is led directly from the outer atmosphere into a channel underneath the hearth, and escaping below the fender and about the fire, is warmed before spreading through the apartment. With stoves and heated pipes, the air should enter about the heated surface; in stoves on the cockle principle, the fresh air, as it enters, is made to pass between the casings of the stove. With an open fire, a very feasible plan is to make the fresh-air channel pass behind the fireplace, and allow the warmed air to escape from concealed openings about the chimney-piece and jambs, or from behind the skirting. In Condry's Ventilating-grate, the fire-box is constructed of hollow pieces of fire-brick communicating with the external atmosphere and with the room.

For a house with fireplaces of the usual construction, perhaps the simplest and most effective expedient is to admit the fresh air into the entrance-hall, and there warm it by means of a low-temperature stove or by hot-water pipes; its passage into the several rooms can then be provided for by regular channels, behind the skirting or otherwise. In America, perforations are frequently made in certain parts of the doors, before which silk curtains are disposed, so as to temper the currents. It is almost unaccountable that in this country the plan of warming the lobby and staircase is so seldom resorted to. To say nothing of the comfort thus diffused through the whole house, and the benefit in point of health, especially to weakly constitutions, the economy of the arrangement is beyond dispute. In the sitting-rooms, not more than one-half the usual quantity of fuel requires to be burned in the open fire; and in the bedrooms, as a rule, fires are rendered altogether unnecessary in the coldest weather. It ought to be observed that when air is admitted by a regular and free channel, comparatively little is strained in by the windows and other byways.

Ventilation by Fans and Pumps.—The fan-wheel has been for many years used in factories, to which it is particularly applicable, from the readiness with which it can be kept in motion by the engine. It is essentially the same as the burn-fanners; the air is drawn in at the centre of the wheel, and flies off at the circumference by centrifugal force. The fan is placed at the top of a flue, into which branches from all parts of the establishment proceed; and when it is set in motion, it draws off the air from every apartment communicating with it. Dr. Arnott observed, that in the fan-wheel as well as in the air-pump or bellows invented by Dr. Hales, a great deal of power was wasted by "wire-drawing" the air—that is, making it squirt through small valves or other narrow openings. To obviate this, he invented a ventilating-pump, which supplied a hospital with fresh air, requiring no other motive-power than the descent of the water used in the establishment from a high reservoir to the lower parts of the building. It is described in his work on "Warming and Ventilation."

Transference of heat from the used air to the fresh.—This is the kind of economy which is put in practice in the Respirator (q. v.) and in the Caloric Engine (q. v.). Whatever difficulties—or impossibilities, as some maintain—there may be in the way of turning this transferred heat into a fresh source of power, nothing seems simpler, in theory at least, than to economise heat in this manner for the warming of dwellings and similar purposes. The idea originated with Dr. Arnott, many years ago. We are not aware that the principle has ever been acted upon; but the possible economy of heat is obvious, and it only requires mechanical ingenuity to realise it.

It will at once strike the reader how desirable it would be to do the same with the impure heated air which we are obliged to eject from our dwellings. Where the ventilation depends upon the draught of a common chimney, it would seem impossible to bring the entering air in contact with that which is escaping; but where the mechanical force of a pump or a fan is employed, nothing seems simpler than to make the two currents run counter to one another for a certain distance in close contact through a system of tubes. The smoke even, which, with the most economical arrangements, still issues from the flues at a temperature considerably above that of the building, might be drawn into the current along with the foul air of the apartments, and the whole reduced nearly to the temperature of the atmosphere before being allowed to escape. Of course, there must be loss in the transference; but a large percentage would be saved, and the consumption of fuel would be reduced by that amount. Were this "double-current ventilation" applied to churches, ball-rooms, theatres, &c., where thousands of persons are assembled, Dr. Arnott believed that "no other heating apparatus would be required but the lungs of the company."

Notwithstanding all the improvements recently effected, it is beyond doubt that this important branch of the art of living is still in a very rude and imperfect condition. A writer in the "Quarterly Review" for April 1866, in a very suggestive article on "Coal and Smoke," points to the radical error of the existing system, when he remarks that "in a household fire heat is, as it were, manufactured on a very small scale; and experience has proved that the cost of production of an article has always been inversely proportionate to the scale of its manufacture." He accordingly suggests that "it seems practicable, in a great measure, to supersede domestic fires, and to lay on heat (heated air), or the means of generating heat (low-priced gaseous fuel), to our houses pretty much as we now lay on gas." The abatement of the smoke-nuisance, and systematic and thorough ventilation, ought to be effected on a similar joint-plan, "by connecting the chimneys of all the houses with underground culverts, provided at intervals with high shafts, in which, if necessary, the draught upwards might be increased by furnaces. We have long been familiar with extensive manufactory, covering large areas, in which are very numerous fires, all in communication with a single lofty chimney. With such an arrangement, no visible smoke should be produced, and with due attention, a smoky chimney should be impossible." In the case of existing houses, the amount of reconstruction necessary might be a serious obstacle; but in building a new street, it might easily be made to empty its entire smoke through the medium of a single tall tower resembling those medieval campanili which are to be seen in Bologna and other Italian cities." It is further proposed to make the ordinary sewers serve the purpose of

culverts for the passage of the smoke to the common chimney. The sulphurous acid of the smoke would destroy the noxious qualities of the sewage gases, and improve the sewage for agricultural purposes; and instead of foul gases escaping through every opening or leak in the sewers, as at present, the powerful suction of the ventilating shafts would draw in fresh air, thus establishing a thorough system of atmospheric sewage. Another effect of the common chimney system would be to make the transference of heat, or double-current ventilation, spoken of above, easily practicable in domestic houses. The pipe through which the heated air and smoke were being drawn away might be made to give up its heat to the counter-current of fresh air which was being drawn in.

Even though such painstaking plans of economising heat might not pay at the present cost of fuel in this country, it is pleasant to think that there is such a resource in reserve. It is not with all countries as with us; and even our stores of coal are not inexhaustible. It is an unworthy, and, in the real sense of the word, an inhuman maxim, that bids us let "posterity look to itself." If the absorbing passion for present gain will not let us begin practising economy now, we may at least seek to devise and perfect plans to be in readiness when the necessity comes. It is not uncommon to hear the argument, that before the coals are done, something else will be discovered as a substitute. We are at a loss to imagine what the something is to be, unless it be the ingenuity to make the fuel that is now wasted in a year last a hundred; and this we believe to be quite possible.

WARMINSTER, a small ancient town of Wiltshire, on the west border of Salisbury Plain, and 19 miles north-west of Salisbury. The parish church dates from the reign of Henry III.; and the interesting edifices in the town and neighborhood are numerous. An important corn-market is held every week. Pop. (1871) 5786.

WARNING, in Scotch Law, means a notice given to terminate the relation of master and servant, or landlord and tenant; corresponding in England to notice to leave and notice to quit respectively.

WAR OFFICE, the immediate office of the Secretary of State for War, and the centre on which pivots the entire administration of the army. It is divided by the "War Office Act" of 1869 into three great departments—the Military, the Ordnance, and the Finance—under respectively the Officer Commanding in Chief, the Surveyor-general of the Ordnance, and the Financial Secretary. All are ultimately responsible to the Secretary of State for War, who has, for his immediate assistance, one parliamentary and one permanent Under-secretary of State.

WAR-OFFICE REGULATIONS consist of the royal warrants regulating the pay, retirement, and allowances of officers and men of the army, together with the instructions to paymasters and others considered necessary for the proper carrying out of the warrant.

WARP, in Weaving, signifies the yarn or thread which runs lengthwise in the cloth. See **WEAVING**.

WARPING, a mode of improving land, practised where rivers bring down large quantities of mud, or where mud is brought up from estuaries by the tide. It is practised in some of the valleys of the Alps; and the rich soil brought down from the mountains is thus arrested, and made to increase the fertility of fields. It is practised also in England, on the tidal waters of the Ouse, Trent, and other rivers falling into the Humber. There are not many places in Britain where the process of warping is capable of profitable application. The term warping belongs to the banks of the Humber. The name *warp* is there given to the large quantity of earthy particles held in suspension by the tidal waters. About a century ago, warping began to be practised, by means of small tunnels made through embankments, the water being allowed to remain, and deposit its sediment of earthy particles, before the sluices were opened for it to flow off. Warping has now long been carried on, upon a larger scale, with large canals, embankments, and flood-gates. Many acts of parliament have been obtained for large warping canals, to lead tide-water over great tracts of land. Land previously sterile and worthless has been covered with good soil, and has become very productive. The "compartment" which is embanked

around, in order to warping, is generally only fifty acres, or less; the farmer warping only one field in a season, because in the meantime it is unproductive. In some cases, however, 500 or 600 acres have been warped in one piece. In the rivers which flow into the Hamber, the water coming down the river in floods is unsuitable for warping, and contains no such quantity of sediment as the tidal waters.

WARRANTICE, in the Law of Scotland, is the obligation to indemnify the grantee, or purchaser of land if, by defect of title, there should be an evictive or paramount claim established against the lands. Warrantice is personal or real; and personal warrantice is subdivided into general and special. Special warrantice is either (1) simple—i. e., that the grantor shall do nothing inconsistent with his grant; or (2) warrantice from fact and deed—i. e., that the grantor has not done, and will not do any contrary deed; or (3) absolute warrantice, or warrantice against all dead—*contra omnes mortales*—i. e., that the grantor shall be liable for every defect in the right which he has granted. Real warrantice is where the grantor or vendor conveys another estate or lands, called warrantice lands, to be held by the grantee in security of the lands originally granted.

WARRANT OF APPREHENSION is an authority given by a justice of the peace to apprehend a person who is charged with a misdemeanor, felony, or treason. It is in the form of a command in her Majesty's name, issued by the justice to a constable, and to all other peace-officers of the county, reciting that an offence has been committed, and that oath has been made as to the offender, and commanding the constable to bring the offender before him (the justice), or some other of her Majesty's justices, to answer the said charge, and be dealt with according to law. The warrant must be signed and sealed by the justice. It may be issued and executed on a Sunday as well as any other day. In Scotland, the sheriff or justice of the peace who issues a warrant to arrest does not seal the document. In both countries, the warrant must name the individual arrested. In England, the party must either be taken or seized, or hands must be laid on him, accompanied with the words: "I arrest you." If the party arrested demand to see the warrant, the constable, if a known officer, is not in strictness bound to shew it to him; but if the officer is not a known officer, and not acting within his precinct, then he must shew the warrant. It is enough for the constable to say simply that he arrests in the Queen's name. If the party to be arrested be in a house, and the doors be fastened, the constable may, after first demanding admittance, and being refused, break open the doors. If, however, the house be a stranger's house, the constable who breaks open the door is not justified in doing so unless the accused be actually within. A general warrant, i. e., a warrant to apprehend all persons suspected, without naming or particularly describing any individual, is illegal and void for uncertainty, for mere vague suspicion is not enough to deprive any man of his liberty. A practice had obtained in the Secretary of State's office ever since the Restoration, grounded on some clauses in the acts for regulating the press, of issuing general warrants to take up (without naming any person in particular), the authors, printers, or publishers of such obscene or seditious libels as were particularly specified in the warrant. When these acts expired in 1704, the same practice was inadvertently continued in every reign, except the last four years of Queen Anne, till the question was raised and decided as to the validity of such warrants, and they were declared by the Court of Queen's Bench illegal. The House of Commons in 1766 also passed a resolution making the issuing of general warrants illegal.

WARRANT OF ATTORNEY, in English Law, is an authority given by a debtor to some attorney to enter up judgment against him in any action that may be brought to recover a particular debt. It is generally given by a debtor when he finds he has no defence, and wishes to gain time; and if he do not carry out his promise, the effect is that the attorney can immediately sign judgment, and issue execution against him, without the delay and expense of an ordinary action. But to prevent the malpractices of attorneys, and any imposition upon ignorant men, no such warrant is legal unless the debtor had his own attorney present, expressly named by him, and attending at his request, to inform him of the nature and effect of such warrant; and such attorney must subscribe his name as a witness. It is also provided that all warrants of attorney shall be void unless they are filed, within 21 days after execution, with the clerk of the judgments in the Queen's Bench.

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WARRANT-OFFICERS, on Shipboard, are the highest grade to which seamen ordinarily attain. They are the gunner, boatswain, and carpenter. Their widows receive pensions.

WARRANTY, in English Law, is a promise or covenant to warrant or secure, against all men, a certain person the enjoying of the thing granted or sold to him. As applied to ordinary sales of things personal, it is used to secure the truth of certain representations which the purchaser has no means, or has imperfect means, of ascertaining for himself, and yet the knowledge of which is material to the contract. The law does not imply on the part of the seller of an article in its natural state, who has no better means of information than the purchaser, and who does not affirm that the article is fit for any particular purpose, any warranty or undertaking beyond the ordinary promise that he makes no false representation calculated to deceive the purchaser, and practises no deceit or fraudulent concealment, and that he is not cognizant of any latent defect materially affecting the marketable value of the goods. In the ordinary sale of a horse, the seller only warrants it to be an animal of the description it appears to be, and nothing more; and if the purchaser makes no inquiries as to its soundness or qualities, and it turns out to be unsound and restive, or unfit for use, he cannot recover as against the seller, as it must be assumed that he purchased the animal at a cheaper rate. And on the sale or transfer of wares and merchandises, if nothing is said as to the character or quality of the thing sold, the buyer takes the risk of all latent defects unknown to the seller at the time of the execution of the contract of sale; all that the seller answers for being that the article is, as far as he knows, what it appears to be. Whenever a man sells goods as owner, he impliedly undertakes and promises that the goods are his own goods, and that he has a right to make the sale and transfer which he proposes to make; and if he was not the owner, he is responsible in damages if the real owner claims them from the purchaser. If the purchaser does not himself inspect and select the subject-matter of sale, the seller impliedly warrants the article he sells to be the very article the purchaser has agreed to buy, and is responsible in damages if he furnishes a different article. If the vendor is told the article is wanted for a specific purpose, then he is taken to warrant impliedly that the article he furnishes is sufficient for that purpose. Every victualer or dealer in provisions impliedly warrants them to be wholesome and fit for food. But a private person who does not trade in provisions is not responsible for selling an unwholesome article of food without fraud and in ignorance that it is unfit to eat. Where buyer and seller have equal means of knowledge, then the vendor is not liable for any representation which he makes without fraud; but if, from the nature of the case, the vendor has the exclusive means of knowledge, then he impliedly warrants that what he says is true. Warranty is also to be distinguished from mere matter of opinion or belief. When a servant sells a horse, he has no right to give a warranty, unless his master expressly authorised him to do so. In the law of Scotland, the doctrine of Warranty of Goods does not substantially differ from the above.

WARREN, Henry, president of the Institute of Painters in Water-colors, was born in London, September 24, 1798. W.'s father inherited considerable wealth, which, however, he contrived to dissipate, and his children were left to shift for themselves. The subject of this memoir at first got a situation in a counting-house; but afterwards, having an intense love for art, was placed in the studio of Nollekens, the celebrated sculptor of the day. At Nollekens's, he was associated with Bonomi and Gibson. Through Benjamin West, W. obtained an introduction to the sculpture-room of the British Museum, where he practised both drawing and modelling, and where he used to meet Haydon's pupils, Bewick, Christmas, and the Landseers. In 1818, he became a student of the Royal Academy, where he attended regularly for many years in the company of Ety, the Landseers, F. R. Lee, Webster, and others less distinguished. W.'s first paintings were in oil. He exhibited several of these from time to time at the Academy. One was a subject from Collins's "Ode to the Passions." Ety thought very highly of this picture, and W. repeated it in water-color, and sent it for exhibition to the "New Society of Painters in Water-colors," of which he became a member at its foundation in 1835. Of this society, now known as the "Institute of Painters in Water-colors," W. has been president for the last thirty years, during which time, both by his teaching and example, he

has done much towards raising the English school of water-color drawing to the proud eminence that it now occupies in comparison with the same branch of art in foreign countries—namely, the highest place of all. W.'s first great picture in water-colors was "The Happy Valley," from "Rasselas," a piece embodying both landscape and figures, and displaying great power both in its composition and coloring. A great many of his subsequent pictures are on Eastern subjects, leading some persons to suppose that he has lived a long time, or at least travelled much, in Egypt, the Holy Land, Arabia, &c. But this is not the case. Among these Eastern subjects, many are scriptural, as—"Rebecca at the Well," "Hagar and Ishmael cast out into the Wilderness," "Christ and the Woman of Samaria," "Joseph's Coat brought to Jacob," "Christ with his Disciples in the Cornfield," "The Death of the First-born," "The Flight into Egypt." Of Eastern subjects not scriptural may be named—"The Dying Camel in the Desert," well known by the engraving so deservedly popular; "A Halt in the Noble Desert;" "Moslem Charity;" "The Crusaders' First Sight of Jerusalem;" and "The First Sunset witnessed by our First Parents." This picture, with its beautiful landscape and admirably drawn figures, is said by a good authority to be "worthy of being classed with the best works of John Martin and Danby." Of subjects not Eastern there may be mentioned—"Alfred in the Swineherd's Cottage," "The Warrant exhibited to the Lady Abbess of a Benedictine Nunnery for the Suppression of her Convent," "Incipient Courtship," "Happy Nutting Days," &c., besides numerous English landscapes done from nature with much feeling and truthfulness. W. is an honorary member of the "Société Belge des Aquarellistes," and of the "Pennsylvania Academy of Arts;" he is also Professor of the Fine Arts at Queen's College, London. He was one of the Committee of Selection in the Fine Arts Department for the Great International Exhibition at Paris in 1855; again for that of London in 1862; and for that of Paris again in 1867. W. has written a little book on "Artistic Anatomy," which has gone through many editions; also a book on "Water-color Painting;" two funny books, "Notes upon Notes," and "Hints upon Hints;" and an antiquarian work, "On the River Ravensbourne." In 1829, W. was married to Isabella, niece of John Martin the painter, and has a son, Edmund George, also a water-color artist, whose drawings of landscape—especially when he deals with woodland scenery—have, by their originality and truthfulness, placed their author in the foremost rank of landscape painters.

WARREN is a place kept for the purpose of breeding game or rabbits. In its strict legal sense, a right of free warren can only be derived by grant from the crown, and gives certain privileges to the warrenor as to recovering game and destroying dogs which infest it (see Paterson's "Game Laws," 20); but in the popular sense, a warren merely means a preserve for keeping game and also rabbits.

WARRINGTON, a parliamentary and municipal borough and manufacturing town of Lancashire, on the right bank of the Mersey, 16 miles east of Liverpool by railway. After the parish church, which is of Saxon origin, the chief buildings to be mentioned are the cotton and other factories and the cloth-halls. In the older streets, ancient wooden houses are even yet to be seen. The manufactures of W. comprise cotton goods, as fustians, twills, corduroys; sailcloths and sacking; flax, plus, wire and wire-woven work; glass; leather and soap; and a famous ale is brewed. Vessels of 100 tons can ascend the Mersey as far as the bridge of this town. Pop. of parliamentary borough, which returns one member to parliament, (1871) 33,058.

WARSAW, formerly the capital of Poland (q. v.), now capital of the Russian, or rather Russianised, government of W., stands on the left bank of the Vistula, about 200 miles east of Berlin by railway. Lat. of observatory, 52° 18' n., long. 21° 2' e. It stands partly on a plain, partly on rising ground sloping upwards from the left bank of the river, extends over a wide area, and consists of the city proper, and of a number of suburbs, several of which are beautifully built. A bridge of boats 1628 feet long connects W. with the suburb of Praga, on the right bank of the Vistula. The streets are mostly narrow, though in several instances they are broad and handsome. The Vistula at W. is broad, shallow, and ever-changing in its sandy course, and is navigable for large vessels only when, after thaw, rivers of melted snow pour down into it from the Carpathians, or when it is swelled by the autumn rains. But

the only craft seen here on the Vistula are rude rafts, usually laden with wheat, which they convey to Dantz by river, and (within the last few years) steamers at intervals. Seen from Praga, on the right bank, the Castle, standing on a steep ascent, has a most imposing effect. Attached to the Saxon Palace are a spacious court and gardens, which are considered the finest promenade in the city. Among the other buildings there are nearly 80 palaces; the cathedral of St John (dating from 1250), a Gothic building of great beauty, containing statuettes and many interesting monuments, among which is one by Thorwaldsen; the Lutheran church, the loftiest building in W., and numerous other places of worship, including synagogues. There are several large and memorable squares, as the Sigismund Square, containing the monument, erected by Ladislas IV., in honor of his father, Sigismund III. In this square, in April 8, 1861, 40 unarmed and unresisting Poles were massacred. The citadel, erected by the Emperor Nicholas, for the express purpose of intimidating, and, if necessary, destroying the city, commands, from its situation, every part of Warsaw. The university, broken up by the Emperor Nicholas after the insurrection of 1830, was re-established by decree, 1864, through the influence of the Grand Duke Constantine; and besides this institution, there are several minor colleges, gymnasia, &c. Woollen and linen fabrics are manufactured. Pop. (1873) 79,503. The value of exports and imports by the Vistula in 1873 was £1,597,467. For the history of W., see POLAND, JOHN III. (SOBIESKI), POMIATOWSKI, &c.

WAR-SERVICES. The science of destruction had made such rapid progress during the publication of the "Encyclopædia," that to render the more important descriptive articles complete, it is necessary to add a few words.

ADMINISTRATION, MILITARY.—This is the comprehensive title for all that complicated machinery by which the military force and energy of a nation are endowed with cohesion and vitality. The expression Staff (q. v.) applies in a somewhat similar sense to the governing and ministering centre of a specific army, but is as much inferior to the general Military Administration as a single army is less than the country's aggregate military strength. In every nation the head of the whole administration is the minister of war, whatever exact title he may bear. Under him are the great officers charged with superintending the discipline, payment, and supplies of the army or its parts wherever situated; the military manufactures, and the national reserves. It is not necessary here to specify the various sub-departments under these chief officers; but there is at head-quarters a section representing each civil department serving with the army, and charged with the duty of directing and supervising that department with all things required to maintain its efficiency.

ADMIRAL.—The distinction of flag—red, white, or blue—has been abolished, and the flag-officers now constitute three classes only—viz., admirals, vice-admirals, and rear-admirals, all carrying the white ensign and pendant, and the St George's cross on a white ground as their distinguishing flag, hoisted according to rank at the main, fore, or mizzen mast-head respectively.

AMBULANCE CORPS.—The functions of this body of men are at present undertaken by the Army Service Corps in the British army.—In the French army, the duty is confided to a section, specially trained, of the *Train des Equipages Militaires*.

ARTILLERY, ROYAL REGIMENT OF.—The terms Battalion, Company, and Troop have been abolished, in favor of Brigade and Battery, which apply both to horse and foot artillery. The regiment in 1868 consisted of 83,500 men, thus distributed:

6	brigades of horse artillery, comprising 30 batteries.	
8	" field (foot) artillery, " 62	"
14	" garrison (foot) artillery, " 103	"
8	" mixed (foot) artillery, " 19	"
214		
1	" coast artillery, not in batteries.	
1	" dépôt artillery, "	
83		

This force represented from 1200 to 1300 guns fully equipped for action. See also **ARTILLERY, ROYAL REGIMENT OF.**

BALLISTIC PENDULUM.—The use of this apparatus as a test of the initial velocity of projectiles has nearly ceased, its place having been taken by the Electro-ballistic Apparatus of Major Navez, a distinguished Belgian officer. This apparatus consists of a pendulum moving on a graduated arc of a circle, at a known velocity, at the top of which it is held by an electro-magnet. The projectile is fired through two screens at a known distance apart. In passing through the first screen, it breaks the electric circle, and demagnetises the magnet, causing the pendulum to fall. As the ball passes the next screen, it restores the circuit and the magnetic power, instantly arresting the pendulum in its downward course. The portion of the circle passed over by the pendulum shews the time occupied by the ball in passing from screen to screen; and that distance being known, the initial velocity becomes a question of very simple calculation. Of course, the magnet and the two screens are connected by wires with a voltaic battery.

BARRACKS.—The office of Barrack-master-general had been abolished in 1822, and the duties transferred to the Board of Ordnance. On the extinction of that Board in 1855, barracks came under the control of the Secretary of State for War, who confided the executive to two departments of his office—the Director of Works in regard to buildings and lands, and the Superintendent of the Barrack Department in regard to the personnel. The system of government was so far altered, that all the barrack-masters in any military district were supervised by one of their number, who ranked as district barrack-master. The correspondence of the whole district with the War Office was conducted through this officer. Barrack-masters were granted relative rank and increased pay, with some other minor advantages.—For the most recent changes, see **BARRACKS.**

BOOTY.—A very important decision was given by Dr Lushington, judge of the Court of Admiralty, in 1866, on the subject of the degree of co-operation which entitled combatants to share in booty. The case arose on the question of the *Banda* and *Kirwee* prize-money, captured in 1857–1858 by the Central India Field-force; and, speaking broadly, the decision was that only those divisions of an army could share the booty which were either directly concerned in its capture, or contributing to that operation by co-ordinate fighting within a reasonable distance of the principals. This excludes those portions of the army which inferentially contribute by keeping the enemy employed in other theatres of war. The commander-in-chief of the whole army, with his general and personal staff, take a share as well as the staff immediately in command of the capturing division. In the case in point, the capture was made in Central India, and the divisions at Delhi, the Punjab, and Oude were held to be excluded.

BREVET.—General promotion by brevet has for many years been abolished in the navy, and in 1854 was abolished for the army. Brevet rank can at present be obtained in three ways only, and never extends above the grade of colonel. Captains or majors may receive brevet promotion for distinguished service before the enemy. Lieutenant-colonels have brevet promotion to colonel, after commanding battalions or holding certain staff appointments for five years. When a general officer dies, the senior major and captain in the army receive each a step of brevet rank. Surgeons of twenty years' total service (or of less service for distinguished conduct) receive brevet rank as surgeons-major. These are the only modes in which brevet rank can be obtained. In the United States army, however, brevet rank is given in any grade; and we find officers with the puzzling title of "Brevet-major-general."

BRITISH NAVY.—In 1859, the navy was made a steam-navy, and sailing-vessels of war ceased, practically, to exist. No sooner was this accomplished, at great expense, than, at a still more enormous outlay, it was found necessary again to reconstruct the navy by building vessels more or less encased in iron plates, varying in thickness from $4\frac{1}{2}$ to 7 inches. There were in 1867 thirty-four iron-cased ships in the British navy, of which the *Minotaur* and *Northumberland* were the largest war-ships in the world. Monitors or turret-vessels are being added.—For later information, see **BRITISH NAVY.**

CANNON.—The following table now shows the qualities of ordnance in use in the British army and navy:

BREECH-LOADING RIFLED GUNS.

Name.	Calibre.	Length.		Weight.	
		Fect.	Inches.	Tons.	Cwts.
7-inch.....	7	10	0	4	2
7 ".....	7	9	11	3	12
64-pounder.....	6.4	9	2	3	1
40 ".....	4.75	8	2	1	12
40 ".....	3.75	5	6		16
12 ".....	3	6	0		8
9 ".....	3	5	2		6
6 ".....	2.5	5	0		3

MUZZLE-LOADING RIFLED GUNS.

13-inch.....	13	14	2	23	0
9 ".....	9	12	3	12	0
8 ".....	8	11	4	9	0
7 ".....	7	11	10	7	0
64-pounder.....	6.3	9	3	3	4

SMOOTH-BORE WROUGHT-IRON MUZZLE-LOADERS.

150-pounder.....	10.5	12	3	12	0
100 ".....	9	10	3	6	5

In addition to the above, there are in all fortresses and in many ships numbers of the old cast-iron ordnance, for which the new guns are in course of substitution.

CANNON-FOUNDING.—Guns, whether of iron or brass, have ceased to be cast at Woolwich. All new guns are now formed of iron or steel bars, wound while red-hot into a coil round a mandril, and welded together into a solid barrel. Such a coil never bursts explosively.

CLOTHING, ARMY.—All uniforms are now issued to the soldier without charge against him. It is merely for the renewal of "necessaries" that the price is debited against him, the price being precisely the wholesale cost to government, and far less than that at which the soldier could purchase it.

COAST-GUARD has been organised under the chief direction of a comptroller, who has the rank of commodore, and is at the head of a department at the Admiralty.

COLONEL.—The colonelcy of a regiment is always held, as a sinecure, by a general officer, who receives £1000 a year in line regiments, and somewhat higher pay in the Guards, the best appointment being to the Grenadier Guards at £200 a year. The rank of colonel, when held by an officer who is not a general officer, is always, except in the artillery and engineers, brevet or army rank, carrying no regimental function or precedence with it.

COLONIAL CORPS.—Of those mentioned in a former article, the following were disbanded by 1838: Newfoundland Veterans, Ceylon Invalids, St Helena Regiment, Gold Coast Artillery, Falkland Islands Company. On the other hand, a fourth West India Regiment was added; and a second battalion of the Ceylon Rifles was in course of formation for service in the Straits Settlements and in Hong-kong. The Malta Fencibles have been converted into a corps of artillery, and are highly efficient. For the latest changes, see **COLONIAL CORPS**.

CONTROL DEPARTMENT—sometimes called the **COMPTROL DEPARTMENT**—a pre-siding civil department of the army, the creation of which furnished ground for much public controversy throughout 1867, and for much misapprehension since the appointment of a Controller-in-Chief to the War-office in January 1868. The common idea seemed to be, that this officer, who held high rank in the military hier-

archy, was to control the whole War-office, and consequently the Minister of War himself. His title was not a very felicitous one; but his functions were merely to control the departments charged with army supplies—that is, the Commissariat, Store, Purveyors, Transport, and Barrack Departments. The appointment was the result of an inquiry in 1866 and 1867 by a committee of officers, of whom Lord Strathnairn was chairman. The recommendation was, that the departments specified should not only be concentrated at headquarters; but that in every command there should be a controller, or deputy or assistant controller, according to the importance of the charge, whose duty it should be to harmonize the same departments within the command. It was the corporation formed by the controller-in-chief and these local controllers which constituted the Control Department. (The department was formed in 1870. The Controller-in-chief was in the same year replaced by the Surveyor-general of the Ordnance, a parliamentary officer under the War Secretary. In 1875, the united Control Department ceased to exist and was divided into a Commissariat Department and an Ordnance Store department.) See the article COMMISSARIAT, and the article ORDNANCE DEPARTMENT.

CROSS, VICTORIA. This distinction is also applicable to the navy.

DEPÔTS.—There are as many dépôts as there are battalions, the dépôts being maintained for the sake of training and recruiting at the new dépôt centres. The headquarters of the battalion are not at the dépôt, but with the service companies. Each battalion has two companies at the dépôt, and in time of war these would be the nucleus of a third battalion for that particular sub-district. See DEPÔT.

DOCKYARD BATTALIONS no longer exist, with the exception of a small corps at Malta.

ENLISTMENT, ARMY.—By an act of 1867, the first period is fixed at 13 years, and the second at 9 years, for all arms of the service. Men are also empowered, and encouraged to enlist for general service, as distinguished from enlisting for particular regiments.

ENSIGN.—The use of the white ensign is now peculiar to the British navy; the red ensign being assigned to yacht-clubs and non-combatant government vessels; and the blue ensign to vessels of the merchant service.

FIFER.—A fifer now receives pay at 1s. 1d. a day; and a fife-major, 1s. 11d.

FLEETWOOD.—The School of Musketry at this port has been discontinued.

GUN-CARRIAGES.—In consequence of the great weight of modern artillery, and the enormous strain produced by its discharge, it has been found cheaper and more efficient to construct carriages of wrought iron for all naval and garrison guns of or exceeding $6\frac{1}{2}$ tons in weight.

GUN FACTORIES, ROYAL.—The establishment of Sir William Armstrong & Co. at Elswick, has ceased to be connected with government. When, in 1868, the government work was withdrawn, a sum of £85,000 was paid to the company as compensation for the plant, &c. they had set up for the purposes of the manufacture.

LAUNCH (boat).—The launches of the largest ships of war are now usually decked vessels, fitted with steam-engines, and capable of cruising and fighting on their own account. They are hoisted inboard when the ship is on her course.

MUSKETRY, SCHOOLS OF.—The school at Fleetwood has been discontinued, duplicate establishments being found an unnecessary expense.

PALLISER GUNS AND PROJECTILES.—Since the issue of that portion of the "Encyclopædia" devoted to great guns, a considerable step in advance has been taken under the auspices of Major Palliser, a cavalry officer on half-pay. His guns have related charges that would have instantly shattered any others yet brought forward; and by the aid of his hardened projectiles, shields have been pierced which had defied the heaviest bolts of all other ordnance. Although only prominently before the public during the last few years, this indefatigable officer has been experimenting from time to time since 1864, always in the one direction. Cavalry service in the Crimea and in India interrupted the investigations, but they were resumed when opportunity offered. The principle of Major Palliser's gun is readily understood.

With the large charges used in this country, cast-iron guns were unequal to projecting modern shot and shell, and wrought-iron ordnance were introduced. These answered their purpose to a certain extent, as in the Armstrong and other guns;

but there was an element of uncertainty in their texture, and some of them had burst with bad effects. To this might be added their enormous expense; and the fact that thousands of large cast-iron guns were in store, to all appearance useless. Many attempts have therefore been made to utilise these cast-iron guns, the means adopted being generally to shrink rings of wrought iron over them. This has not proved effectual, and the guns have become preposterously cumbersome. Next, the cast-iron guns were bored up to a greater calibre, and then a thinner cannon (called a tube) was inserted, this tube being a cylinder of wrought iron or steel bored to the proper calibre. The strength thus added to the gun has been but little. Major Palliser's system for converting guns is to insert a tube of wrought iron; but that tube is coiled, as in an Armstrong gun, by winding a bar of iron round a mandril, and then welding it into a continuous barrel. These guns have withstood the utmost strain brought to bear upon them. For the preferable and cheaper process of making new guns, the iron would be cast in the ordinary way around the wrought-iron tube. For the purposes of this tube, Major Palliser finds the softest and most ductile wrought iron the best, having a certain stretch in it. The authorities had already found out that thick iron plates could not be penetrated except by steel projectiles; but their use was greatly limited by their great cost. Major Palliser came, by experiment, to the conclusion, that toughness was not a necessary feature in the shot, and that hardness—no matter how brittle the material might be—was the real thing necessary for extreme penetration. With this view, he selected white iron, and cast it *in chill*, which secures the requisite amount of brittle hardness. To cast in chill, an iron mould of the exact shape is employed, with raised studs of sand inside it. The liquid metal is poured in (the sand studs forming holes for the studs of the future shot or shell to be fixed in); and the rapid conduction of heat by the iron mould causes so sudden a cooling from the outside of the mass, that the particles of iron are driven closer together than in their normal state. This produces intense hardness. The same inventor has ascertained the proper shape for the head of a shot or shell, as opposed to the flat head, the pointed conical head, and the hemispherical head already in use. He determined that the form of greatest power is the *conoid*, which lies between the conical and the hemispherical, the conoid consisting of the intersection of two circles, each with a radius equal to twice the diameter of the projectile.

RECRUITING.—The competition of the labor-market at home and abroad telling very disadvantageously against the recruiting-sergeant, a Royal Commission was appointed in 1866 to consider by what means the evil might be lessened. Although all the recommendations of the commission have not been adopted, several have taken effect. Among others, an Inspector-general has been appointed to superintend and harmonise all the recruiting operations; to render the conditions of service more attractive, the pay of every soldier has been increased twopenny a day, with an additional penny in prospect, if he continue to serve after the expiration of his first period of service. In 1873—1875, further changes were made. See **RECRUITING**.

RESERVE FORCES OF THE UNITED KINGDOM.—By two acts of 1867—one for an "Army Reserve" of 50,000 men, and the other for a "Militia Reserve" not exceeding one-fourth the number of militia—power has been given to organise a more effective body of trained men of previous good service in the army or militia, who shall be immediately available, in case of invasion or imminent danger, for being drafted for the period of danger into the regular army. It was for a time understood to be under contemplation to allow soldiers to commute their last five years of army service into a double period in the Army Reserve, which would leave them at liberty, under restrictions, for civil employment, without depriving the country in any exigency of their services as soldiers. (See, however, the article **RESERVE**.) With a view to harmonise the several constituents of the Reserve, and to give them that corporate organisation which is still wanting, a high officer, the Inspector-general of Reserve Forces, was appointed at the War-office.

There is a growing feeling throughout the country, as well expressed in 1867 by Lord Elcho in the House of Commons, that every citizen should be ready to bear arms in defensive war; and that, with this view, every young man should serve for two years or some other short period with the army on home service. That such a measure would raise the character of the army, while it diminished the cost of recruiting, it is impossible to doubt.

RIFLED ARMS.—Adverting here simply to the system adopted for rifling—whether by grooves or otherwise—the bore of the gun or rifle, and irrespective of the construction of the arm in other particulars, the scientific inquiries of the Government may be said to have been brought to a close.

In small-arms, the competition long lay between the Enfield, Lancaster, and Whitworth systems. Of these, taking all considerations into account, it was held that the Enfield system was incomparably the worst; and the Lancaster system of oval bore the best. In 1871, however, a special committee, appointed to consider the merits of the various breech-loading rifles, decided that, out of 104 different kinds of breech-loading small-arms, the Henry .45-inch bore barrel was the best adapted to the requirements of the service. The Martini breech was adopted along with the Henry barrel, to form the new small-bore rifle of the British army, known as the Martini-Henry. See **RIFLED ARMS**.

In great guns, after protracted experiments with the systems which gave the most favorable prospects—viz., those of Armstrong, Whitworth, Lancaster, Scott, and the French Rifling—it has been decided to give the preference to the French plan, with the exception that the grooves are wider and shallower. All rifled cannon now made in the Royal Arsenal are constructed on this system, which is called the "Woolwich" system, with a variable number of grooves according to the calibre of the piece.

RODMAN GUN.—This has been extensively used for large ordnance (smooth bore) in America, and is said to stand heavy charges. The guns are of cast iron, cast hollow, and then cooled from within, the process producing great hardness round the bore. A 15-inch gun was tried in 1867 at Sho-buryness; but the results, though on the whole not unfavorable, were scarcely such as would lead to its introduction in the British service. It has been suggested that a Rodman gun lined with wrought iron on Palliser's system, would prove a highly effective weapon.

WARTBURG. War of the, the name given both to a grave poetic contest, which is represented to have taken place on the Wartburg, and also to a poem in the Middle High-German dialect, which commemorates the event. At the time when the aforesaid dialect had attained its highest literary development, and its poets enjoyed a brilliant reputation, Hermann, the munificent Landgraf of Thuringia, had made his court a sort of refuge or home for the *irritable rascals*, as well as for many other people. It could hardly fail, under the circumstances, that quarrels and jealousies should abound; and, in fact, allusions to these are sufficiently distinct in several of the most distinguished writers who lived at the Thuringian court—e. g., in Wolfram von Eschenbach and Walther von der Vogelweide. But soon after, the conception of these things underwent a sort of mythical transformation, and the occasional temporary and natural rivalries of the poets were changed into a particular and pre-meditated contest for superiority in poetic skill; and to the list of those poets who actually had intercourse with each other at Eisenach were now added others partly historical, and in part purely fictitious characters—e. g., the virtuous Schreiber, Biterolf, Reinmar (subsequently confounded with Reinmar von Zweter), the almost mythical Heinrich von Otterdingen, and the wholly mythical Master Klingor, the Transylvanian magician and astrologer. On the basis of this historico-mythical tradition, and under the formal influences of the then much admired songs of emulation, riddle-contests, and ecclesiastical plays, there was composed, about the year 1300, a strange, obscure, unharmonious poem in two parts, called "Krieg von Wartburg." In the first of these, executed in a long and artistically managed measure, and entitled "Tone des Fürsten von Thuringia," Heinrich von Otterdingen challenges the other poets to a contest in verse—the fate of the vanquished to be death—and asserts the excellence of Leopold, Duke of Austria, over all the other princes. Victory, however, inclining to the Eisenachers, Heinrich calls in Klingor to his aid, who, on his part, fights his verse-battle against Wolfram by the assistance of evil spirits, with riddles and dark science. With distinct reference to Klingor's "black art," the simpler and shorter measure of this second part is called "Schwarze Ton." Throughout the whole poem, which may be regarded as the first attempt at a secular drama, but which is rather an intermediate link between the Lyric contest and the Drama, one may trace an unmistakable imitation of Wolfram's style of poetry. The author is unknown. From the inequality of the style, one is disposed to conclude that several hands were employed in its composition. The poem, which has been much overrated in modern times, does not seem to have ex-

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exercised any particular influence on literature. In a prose form, the story of the Wartburg Contest first appears—in the Thuringian Chronicles—after the beginning of the 14th c., and probably owes its origin to the poem. The poem was printed in a separate edition by Eitmüller (Ilmenau, 1880), and is also to be found in Bodmer's and Von der Hagen's collection of the "Minnesliger."—See Von Plotz, "Ueber den Sängerkrieg auf Wartburg" (Weimar, 1851).

WARTHE, the longest and most extensively navigable affluent of the Oder, rises on the southwest frontier of Poland, 85 miles north-west of Cracow. In Poland, it flows north and west, and the length of its course in this country is 800 miles. It then flows west-north-west through Prussia for 180 miles, passes Posen, and joins the Oder at Kustrin, where it is 620 feet broad. Total length, 483 miles, for 220 miles of which it is navigable.

WART-HOG (*Phacochoerus*), a genus of *Suidæ*, closely resembling the true hogs in most of their characters, and particularly in their feet, but remarkably differing from them in their dentition; the molar teeth being much like those of the elephant and replacing one another in the same manner. There are two triangular incisors, in the upper jaw, and six small ones in the under; the tusks are lateral, very large, project far from the mouth, and are bent upwards; there are six or eight molars in each jaw. The head is very large, and the muzzle very broad; the cheeks furnished with large wart-like excrescences, so that the appearance is altogether very remarkable and uncount. The species are all natives of Africa. They feed very much on the roots of plants, which they dig up by means of their enormous tusks. The AFRICAN W., or HARUA (*P. Aitani*), a native of Abyssinia and of the central regions of Africa, from the coast of Guinea to that of Mozambique, is nearly four feet long, with a naked slender tail of one foot, is scantily covered with long bristles of a light brown color, and has a mane sometimes ten inches long, extending from between the ears along the neck and back. Another species is found in the south of Africa (*P. Ethiopicus* or *Pallasi*), the *Valke Vark* of the Dutch colonists at the Cape of Good Hope. The incisors of the latter fall out at an early age, those of the former are persistent.—A closely allied genus is *Potamochoerus*, of which there are several species, as the *Bosch Vark* of Cape Colony (*P. Africanus*), which is nearly black, with whitish cheeks having a central black spot; and the PAINTED Pig of West Africa (*P. pentadactylus*), which is reddish, with black face, forehead, and ears. The species of *Potamochoerus* frequent swampy grounds, and sometimes receive the name of WATER-HOG. They have longer ears than the true wart-hogs, tapering and ending in a pencil of hairs; the face is elongated, and has a huge protuberance on each side. The flesh of all the wart-hogs and water-hogs is in high esteem. They are hunted by dogs, which are often killed in the encounter with them. They are much addicted to fighting among themselves.

WARTON, Joseph, D.D., was born at Dunsfold, Surrey, in 1722. His earlier education he received from his father, the Rev. Thomas Warton, sometime Professor of Poetry at Oxford. At the age of 14, he was sent to the great school at Winchester, whence, in 1740, he was transferred to Oriel College, Oxford, where, four years afterwards, he took his degree of B.A. After passing the intermediate years as a curate at Chelsea and elsewhere, in 1748 he was presented by the Duke of Bolton to the rectory of Winsdale, near Basinstoke, a living of no great value, yet sufficient to determine his marriage with a Miss Damon, to whom he had been engaged. Previous to this, he had become known as a writer of verse in the "Gentleman's Magazine," Dodsley's "Museum," &c., and as the author of a volume of "Odes and other Poems." In 1751, he went abroad with the Duke of Bolton; and after his return, he issued, in 1753, an edition of Virgil, with a translation of the "Ætologues and Georgics." This with the critical notes and dissertations appended to the work, met with great approval, and subsequently procured him from the university of Oxford the degree of M.A. In 1766, appeared the first volume of his chief literary performance, the "Essay on the Writings and Genius of Pope," the second and concluding volume of which was not given to the world till 1782. Venturing, as he did, to question the positive supremacy which it was then fashionable to attribute to Pope, W. did not by this work attain any very instant increase of popularity, but the value in relation to the literature of the time, of the critical principles announced in it, as also in his other more casual Essays, has since been sufficiently recognised. In

1755. W. was appointed second Master of Winchester School, of which he became head in 1766. Soon after, he revisited Oxford, and had conferred on him the degrees of Bachelor and Doctor of Divinity. Of preferment in the church, he had subsequently his full share. By the good offices of Doctor Lowth, Bishop of London, he was made, 1782, a Prebendary of St Paul's and the living of Thorley, in Hertfordshire, was conferred on him. He obtained besides, in 1788, a prebend in Winchester Cathedral, and the rectory of Easton, which he soon after exchanged for that of Upham. The Mastership of Winchester he resigned in 1798, and devoted himself to the preparation of an annotated edition of Pope, which was completed in 9 vols. 8vo. in 1797. At his death, 23d February 1806, he was engaged on a similar edition of Dryden, of which he had published two volumes. Though W.'s reputation has not survived as a poet, yet it certainly has as a critic, along with that of his more distinguished brother.—See "Biographical Memoirs of Rev. Joseph Warton, D.D.," by Rev. John Woolf, A.M. (1806).

WARTON, Thomas, the younger brother of the preceding, was born in 1728, at Baslugatoke, in Hampshire, of which place his father had then become vicar. His earlier education he received chiefly at home from his father; and in 1748, he was entered at Trinity College, Oxford, where, in 1750, he took his degree of M.A. The year after, he obtained a fellowship. He remained at the university, employed as a tutor; and in 1757, he was made Professor of Poetry, in which capacity he was much esteemed as a lecturer. In 1767, he took his degree as Bachelor of Divinity, and was soon after presented to the living of Kiddington by the Earl of Lichfield. In 1782, that of Hill Farrance, in Somersetshire, fell to him by favor of his college; and these two unimportant pieces of ecclesiastic preferment were the only ones he ever enjoyed. Very early, he became known as a poet, and in 1754 he published a volume entitled "Observations on the Fairie Queens of Spenser," which established his reputation as one of the first critics of the day. In a second edition of the work, issued in 1762, it was expanded into two volumes. Of W.'s miscellaneous literary activity, no account need be given in detail. The work by which he is now chiefly remembered is his "History of English Poetry," the first volume of which was published in 1774. Two other volumes followed in 1778 and 1781, but at his death the work remained unfinished. In its wealth of information regarding the earlier portion of our literature, the book remains to this day unrivalled. As a poet, also, W. takes distinct if not very high rank. In 1777, he published a collection of such of his scattered pieces as he deemed most worthy of being reprinted, and the acceptance it met with is shewn in the successive editions of 1778, 1779, and 1789, as also in the fact, that on the death of Whitehead, the poet-laureate, W. had the honor, such as it might be, of being selected to succeed him in the office. The last work on which he was engaged was an elaborately annotated edition of the Minor Poems of Milton. Of this, published in 1815, a carefully prepared re-impression was issued the year after his death, which took place suddenly on the 21st May 1790. In 1802, a new edition of his poems was published, with a life of the author by Mr Mant.

WARTS (sometimes known in Surgery by their Latin name *Verrucae*) are collections of lengthened Papillæ of the Skin (q. v.), closely adherent and ensheathed by a thick covering of hard, dry cuticle. From friction and exposure to the air, their surface presents a horny texture, and is rounded off into a small button-like shape. Such is the description of the simple wart, which is so commonly seen on the hands and fingers (and rarely on the face or elsewhere) of persons of all ages, but especially of children. Amongst other varieties of warts are: (1) One to which the term *Verruca digitata* has been applied. It is more elongated in shape, and less protected by cuticle than the preceding. It is said to occur nowhere but on the scalp of women of adult age, and sometimes to occasion great annoyance in brushing and combing the hair. (2) *Subungual warts*, growing, as their specific name implies, beneath or at the side of the finger or toe nails. They originate beneath the nail, and as they increase, they crop out either at the free extremity or the side of the nail, and are usually troublesome, and often very painful. They are generally of syphilitic origin. (3) *Veneral warts*, caused by the direct irritation of the discharges of gonorrhœa or syphilis, and occurring about the parts which are liable to be polluted with such discharges. They attain a larger size, and are more fleshy and vascular than other warts.

Nothing is known of the causes of warts further than the third variety is induced by an irritating discharge, that the malignant form of wart which is the beginning of chimney-sweepers' cancer is caused by the irritation of soot, and that persons engaged in dissection and *post-mortem* researches are especially liable to them; hence we may infer they are always due to some local irritation. Venereal warts are certainly contagious; with regard to others, we cannot speak positively. In some cases, but not invariably, blood from a wart is capable of producing similar warts when applied to the skin. In consequence of the capricious way in which warts often spontaneously disappear, there are numerous popular charms for their removal, several of which may be found recorded in the pages of "Notes and Queries." Common warts are so apt to disappear, that they may be often left to themselves. If it is desired to remove them, glacial acetic acid is perhaps the best remedy: it must be applied with a camel-hair pencil till the wart is pretty well sodden, care being taken not to blight the neighboring skin. One or at most two applications are usually sufficient. Nitrate of silver and tincture of iron are popular and general applications. Small warts hanging by a neck, may often be very simply removed by the moderately tight application of an elastic ligament (for example, a small broken elastic ring) to the base. The wart usually shrivels up, and falls off within a week. The other varieties of warts must be left to the surgeon.

WARWICKSHIRE, one of the midland counties of England, bounded on the w. by Worcestershire, on the n. by Stafford and Leicester shires, and on the e. mainly by that of Oxford. Area, 610,587 acres; pop. (1871) 630,472. The surface, though presenting no lofty hills, is marked by gentle eminences and vales. The north districts of the county were formerly occupied by the forest of Arden, of which there are still remains; and the scenery, in general remarkably rich and charming, is varied by moor and heath. The principal rivers are the Avon, flowing from north-east to south-west; and the Tame in the north. The soil varies much in quality, being cold and heavy on the higher and more exposed positions; while in more favorable districts, it is as a rule good. Of the whole area, 435,346 acres were (1875) under all kinds of crops, bare fallow, and grass; under corn crops, 151,365; under green crops, 84,284; clover, sainfoin, and grasses under rotation, 40,479; and 244,392 were under permanent pasture. Of minerals, coal, stone, lime, and marl are found. The county returns four members to the House of Commons.

WARWICK, a municipal and parliamentary borough, chief town of the county of the same name, stands in the middle of the county, on the Avon, 20 miles south-east of Birmingham. It is a very ancient town, and contains many ancient and interesting buildings and institutions. Of these the most notable is Warwick Castle, the principal residence of the Earls of Warwick, beautifully situated on a rocky elevation, 40 feet high, on the banks of the Avon. Of this edifice, Guy's Tower, 128 feet high, was built in 1594; and Caesar's Tower, still more ancient, is 147 feet high. The interior, before the castle was partly burned, Dec. 3, 1871, was remarkable for its splendor and elegance, and is being restored in similar style. The Earl of Leicester's Hospital for aged brethren has an annual income of £2018. There are numerous other charities, with schools, libraries, &c. Agriculture and general trade afford employment to a large number of the inhabitants. W. returns two members to the House of Commons. Pop. (1871) 10,936.

WARWICK, a township of Rhode Island, U. S. America, 10 miles southwest of Providence, on Narragansett Bay, and the Stonington and Providence Railway, containing the villages of Natick, Phoenix, Centreville, Arctic, Crampton and Apponaug. It has 22 cotton mills with 160,000 spindles and 4,000 looms, 2 woollen mills, 2 bleacheries, 2 print-works, 15 churches. Drum Rock, a balanced rock of great size, can be moved by a child, and makes a sound which can be heard for miles. Pop. (1870) 10,453; (1880) 12,164.

WARWICK, Richard Neville, Earl of, K. G., popularly named the King-maker, was eldest son of Richard, Earl of Salisbury, and Alice, daughter and heiress of Thomas Montacute. He was born about 1420, shortly before the accession of Henry VI. Lord R. Neville, as he was then styled, early manifested his distinguished bravery and brilliant personal qualities in a hostile incursion across the Scottish marches, in which he accompanied his father, the Earl of Salisbury. He became the most powerful nobleman in the kingdom by his marriage with Anne,

daughter and heiress of Richard de Beauchamp, Earl of Warwick. He not only acquired by this alliance the broad lands of the Warwick family, but was created Earl of Warwick, with succession to the heirs of his wife. He is the most prominent figure in the civil War of the Roses, one of the darkest periods of our history. The Duke of York gained his support by his marriage with Lady Cecille Neville; and when the Barons declared the incapacity of Henry VI., and chose the duke to be protector of the kingdom, Warwick led into the field his well-armed borderers of Wales. The Yorkists and the Lancastrians first met at St. Albans in 1455, when Warwick, rushing suddenly into the town at the head of his men, mainly won the battle by his impetuous onset. He was rewarded with the government of Calais—"then," says Comines, "considered as the most advantageous appointment at the disposal of any Christian prince and that which placed the most considerable force at the disposal of the governor." He also obtained command of the fleet for five years. In 1458, he sailed from Calais with five large and seven small vessels, and attacked a fleet of 23 ships, belonging to the free town of Lübeck. After a battle of six hours, he took six of the enemy's vessels. In 1460, he landed in Kent at the head of his troops, and entered London amidst the acclamations of the people. He defeated the queen's army near Northampton, with great slaughter, and obtained possession of the person of the king. Richard, Duke of York, now advanced his claim to the throne. Queen Margaret raised an army to rescue the king; and the duke committed the idiotic monarch to the custody of the Duke of Norfolk and Warwick, while he advanced to Wakefield to attack the Lancastrians. The duke was taken, and put to death; and Warwick's father, the Earl of Salisbury, with twelve other Yorkist chiefs, was beheaded at Pontefract. Another battle at St. Albans was won by the Lancastrians; but Edward, Earl of March, now Duke of York, accompanied by Warwick, marched boldly upon London, which was throughout Yorkist, and Edward was proclaimed king by the style of Edward IV. The next battle was that of Towton, near York. The Lancastrians had reinken the pass of Ferrybridge, on the river Aire, and Warwick, in despair at the loss of so good a position, rode up to Edward, and dismounting, shot his own horse through the head, as a signal for an attack from which there could be no retreat, exclaiming: "Sir! let him flee who will flee; but by this cross" (kissing the hilt of his sword) "I will stand by him who will stand by me!" The Lancastrians were defeated with immense loss; and Edward returning to London in triumph, was crowned June 22, 1461. The battle of Hexham was followed by the capture of Henry; and Warwick, who had been left in command in London, placed the deposed king on a horse, under whose belly his feet were fastened, and thus led him through Chertsey to the Tower. Warwick having been authorised to negotiate with Louis XI. of France for the marriage of his sister-in-law, the Princess Bonne of Savoy, to King Edward, could not brook the king's sudden marriage with Elizabeth Woodville, and seemed inclined to shew that he could pull down as well as set up kings. He was now at the height of his power. To the earldoms of Warwick and Salisbury, with the estates of the Spencers, he added the offices of High-admiral and Great-chamberlain, together with the lord-lieutenancy of Ireland and the government of Calais. Comines states the income of his offices at 80,000 crowns a year, besides the immense revenues accruing from his patrimony; yet he had the meanness to accept a secret pension and gratuities from Louis XI. After being sent into honorable banishment by means of embassies to France, Burgundy, and Brittany, he gave his daughter in marriage to George, Duke of Clarence, without asking Edward's permission. He soon afterwards broke out into revolt against Edward, and concluded a treaty with Queen Margaret, by which it was agreed that her son, Prince Edward, should espouse Anne Neville, Warwick's daughter, and that in failure of issue, the crown should devolve on Clarence. King Edward escaped to Holland; and Henry VI. resumed the sovereignty. Edward, however, raised a body of Flemings and Dutchmen, and, landing near Hull, advanced towards London. He gave battle to King Henry's army, commanded by Warwick, at Barnet, April 14, 1471. The battle was memorable and important. Warwick and his brother Montague were left dead on the field, and with them fell the greatness of the House of Neville. This fatal battle, followed by the decisive engagement of Tewkesbury, completed the defeat of the Lancastrians, and concluded the sanguinary War of the Roses. It appears (Fenn's "Letters") that every individual of two generations of

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the great families of Warwick and Somerset fell on the field or on the scaffold, a victim of these sanguinary contests. Warwick is the most conspicuous personage of these disturbed times. He kept open house wherever he resided, and daily fed at his various mansions 80,000. He loved turbulence for its own sake, and was ready to make or unmake any king, according to the caprice of the moment, and in order to shew his power.

WASH, a wide estuary on the east coast of England, between the counties of Lincoln on the north-west and Norfolk on the south-east, is about 22 miles in length, and 15 miles in average breadth. It is surrounded by low and marshy shores, and receives the rivers Witham, Welland, Ouse, Nen and Nar. The estuary for the most part is occupied by sandbanks, dry at low water, and between these sandbanks are the channels through which the rivers mentioned flow into the North Sea. On both sides of the channel by which the Ouse falls into the sea, considerable tracts of land have been reclaimed. Anchorage is afforded to vessels by two wide spaces of pools of water, called respectively Lynn Deep, opposite the coast of Norfolk, and Boston Deep, opposite the Lincolnshire coast.

WASHING AND WASHING-MACHINES. Although domestic washing is a simple enough process, yet it may be useful to give a brief description of the most efficient way of conducting it, in so far as experience and correct principles can guide such an operation. The first essential is suitable water, in other words, *soft* water. See **WATER-SUPPLY**. Yellow Soap (q. v.) being the kind chiefly used in washing linen, it is well to bear in mind that it is not desirable to purchase it very pale in color, or very low in price. In order to gratify the desire for a light color, soap makers are obliged to reduce the strength of good dark soaps with adulterants; and it will give some idea of how easily the demand for cheapness may be met, to state, that hard soap, which should not contain so much as 35 per cent. of water, can be made with as much as 75 per cent. Soap, as is well known, improves by keeping. Soft or potash soap is sometimes used to wash coarse things, on account of its being stronger than hard soap, but its smell is objectionable. Soda is easily procured good; and with respect to washing-powders, as their merit depends on the amount of alkali which they contain, suffice it to say that to buy them is only a dear way of buying soda.

In arranging clothes for washing, it is desirable to sort them into kinds most suitable for washing together; such as lace, nets, and fine muslin into one heap; white body-linen into another; colored things of the nature of prints and gingham into another; and so on. It is also desirable to wash clothes as soon as possible after they are soiled. Previous to washing, all white articles should be soaked for a night in cold water, in which a little soda has been dissolved, as the steeping in alkaline water greatly aids in removing all dirt of a greasy nature. The clothes should then be washed twice in clean tepid water with a sufficient supply of soap. If the water is quite cold, the dirt is taken off with difficulty; and if too hot, it is apt to fix it into the fibre of the cloth. The clothes should next be examined for spots or stains, so as to remove them, if possible, by an additional rubbing; after which they are boiled for at least 15 minutes in soap and water. Ink-stains or iron-moulds require to be taken out with oxalic acid, or the essential salts of lemon (oxalate of potash); and fruit-stains by boiling the stained parts with pearlsh. After being boiled, the clothes are rinsed twice in cold water; and in the second rinsing, a little stone blue is added, to neutralise any yellowness occasioned by the washing. When this is done, they are wrung, and hung out to dry.

For the washing of flannels, it is even more desirable that the water should be soft than for linen or cotton; and it should contain no soda or potash in any form, as although a little alkali would more effectually remove dirt, yet it always turns woollens yellow, and at the same time thickens them. It is well to remember also that all rubbing, wringing, or squeezing tends to make woollen goods shrink, by facilitating their tendency to felt or mat into a thicker fabric. With respect to ladies' colored dresses made of fine wool, such as merino, it is considered best to wash them in warm soft water with ox-gall, say a pint in a tubful of water. Ox-gall is a soap in its chemical nature, and it clears and brightens the colors.

The washing of printed cotton fabrics, especially muslins, has of late years become a difficult operation, on account of the fugitive nature of some of the dye-

stuffs employed. The beautiful hues produced by the aniline or coal-tar colors, and by the archil lakes in imitation of them, have led to their being extensively used in calico-printing, as well as in the dyeing of silk and wool. These dyes can scarcely be said to be permanent on any fabric; but on cotton they require to be fixed by mordants, such as albuinen (white of egg), which will scarcely stand washing at all, and to which hot water is utter destruction. The same thing is true of some other dyes, such as the light blue produced by artificial ultramarine. If economy is to be studied, it is far better to have printed dresses done in fast colors—the reds and purples, from madder, for example—as they, although less attractive at first, can be washed without injuring their appearance. All such articles should be washed in soft warm water; that which has been used for flannels, if not too dirty, will do. When thoroughly cleaned, rinse them well in clean cold water, and do not allow them to remain long in contact before they are hung up to dry.

White silk articles, as stockings and gloves, should be washed with soap, first in milk-warm, and afterwards in nearly boiling water. They will be improved if hung up for a short time in the fumes of burning sulphur (sulphurous acid) while still damp.

We have now to notice the domestic washing-machines which have, of late years, come into rather extensive use. A machine of this kind, when in motion, ought to produce at least as much agitation as will keep up a constant change in the deterging solution in contact with the linen, and at the same time cause the clothes to slide over each other in a somewhat analogous manner to hand-washing. There is an old form of washing-machine called the *dolly-tub*, which has been in use in Yorkshire for upwards of eighty years. It consists essentially of a presser or dolly, which is simply a round piece of wood, say ten inches in diameter, with from three to five legs rounded at the ends; the whole exactly resembling a footstool, but with the addition of an upright rod or spindle from its centre, with a cross piece at the top for working it. Any vessel, such as a tub, barrel, or box, may be used to hold the clothes, which are washed by moving the dolly first one way and then the other, at the same time a certain pressure being exerted on them against the sides and bottom of the vessel.

Of recent washing-machines, a certain class of them are modifications of the dolly-machine, with spring-ribbed boards, on which the linen is rubbed by a swinging motion. Another class consists of boxes which also oscillate upon an axis, but operate by jerking the clothes and water from side to side. A third, and perhaps the most efficient class are made upon the principle of the dash-wheel, so much used in large bleach-works. In this machine, the materials to be washed are lifted by internal ribs on the rim of a large wheel, and allowed to fall with some force from fully half its height into the cleansing liquid—this being of course repeated as the wheel rotates. The linen is put inside the drum or dash-wheel, (a spoked cylinder), which has a reciprocating action, so that, after making a complete revolution, it is reversed. The clothes are thus driven both ways through the water, and the quick reversing action of the machine gives them a jerk or dash at each change of motion—the equivalent of the fall from a large dash-wheel. There are brushes on the inside of the drum, which are brought into play if the clothes are coarse and dirty, but are turned out of action if they are of a fine description. A machine of this kind, 26 inches wide, will take in two pair of sheets or a dozen of shirts at a time, and by turning the handle with a brisk motion, they will be washed in eight or ten minutes. The lather for linen is made up with one pound of soap, half a pound of soda, and three quarts of water—the last being poured in boiling. Only about half as much soap is required as for washing by hand.

The wringing is performed by passing the wet clothes through wooden rollers, the upper one being temporarily covered with flannel to protect buttons, hooks and eyes, &c. from damage. The necessary pressure is obtained by means of a spring, and before turning the rollers, the washing-cylinder is thrown out of gear. With the aid of mangling-boards, the clothes are mangled by these same rollers.

Washing by Steam, though little known in England, is practised to a considerable extent in France. The French chemist, Chaptal, first brought the process to perfection. Besides a saving of fuel, soap and manual labor to the extent of at least one-half, the wear and tear of the linen attending rubbing and beating is avoided. The efficacy of steam in washing depends upon its penetrating and dissolving property. The clothes are first steeped in a ley of soda or potash, or in a mixture of

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alkali and soap, and then hung in a wooden vessel kept full of steam by a pipe communicating with a boiler. On a small scale, a large cask, made air-tight, will answer, and a common tea-kettle will produce steam enough. There must be an aperture to allow the air to escape when the steam first enters; the air being expelled, the aperture is shut. In half an hour, the dirt is efficiently loosened to wash out with ease, and the linen is found to be extremely white.

WASHING OF FEET (called in Latin *Peditavium*, and sometimes *Mandatum*, from the first word of the "little chapter" in the service), one of the ceremonial observances of the Holy Week (q. v.) in the Roman Catholic Church. It forms part of the service of Holy Thursday, which day, from the word *mandatum*, is also called Maundy Thursday. The origin of this observance is extremely ancient. It is founded on the example and exhortation or precept of our Lord in John xiii. 5-14; and is traceable in the writings of Justin, Tertullian, Ambrose, and Augustine, as well as in many of the early councils. In some churches, however, or at least at some particular periods, the day fixed for the ceremonial was Good Friday, although for many centuries it has uniformly been assigned to Holy Thursday. It is necessary, however, to distinguish from the ceremonial of the Holy Week, another washing of the feet (also called *peditavium*), which, in the case of catechumens, preceded baptism, and which, in many churches, was accompanied by a washing of the head, *capitavium*, and took place on Palm Sunday (q. v.), thence called "Dominica Capitavii." To this usage Sts Ambrose and Augustine distinctly refer. In the medieval and modern church, the washing of feet has generally followed the solemn mass of the day. In those churches where the ceremony is still retained, the officiating bishop or priest, wearing a cope, and girt with a towel, and attended by a deacon and sub-deacon, washes, dries, and kisses the right foot of a certain number of pilgrims, generally twelve, in memory of the twelve apostles; after which all the pilgrims are hospitably entertained, and served in person by the bishop, who distributes to each a dole in money or provisions. An appropriate service, consisting of a gospel (John xiii. 1-14) sung by the deacon, a chapter ("Mandatum novum") chanted by the choir, and a prayer by the bishop, accompanies the ceremonial. The washing of the pilgrims' feet on Holy Thursday forms a very striking part in the Holy Week ceremonial as carried out not only by the pope, but also by the bishops in most of the great cathedrals abroad. It was also practised by kings and other royal and noble personages, even down to a very recent date.

WASHINGTON, George, Commander-in-chief of the Continental forces in the war of the American revolution, and first President of the United States, was born in Westmoreland county, Virginia, February 22, 1732; son of Augustine Washington and his second wife, Mary Ball; a descendant of John Washington, who emigrated to Virginia from England about 1657, who was a grandson of John Washington, mayor of Northampton, and first lay-proprietor of the Manor of Sulgrave, in Northamptonshire, who married a daughter of Shirlly, Earl Ferrers. Lawrence, an elder brother of John, studied at Oxford; John resided at one time at South Cave, Yorkshire. Being royalists in the time of Cromwell, both emigrated, and became land-proprietors and planters in Virginia, in the district between the Potomac and Rappahannock rivers. Augustine Washington died when his second son George was 12 years old, leaving a large property to his widow and five children. His education in the indifferent local schools extended only to reading, writing, arithmetic, book-keeping and land surveying, then an important acquisition. He grew tall, had great physical strength, and was fond of military and athletic exercises. At the age of 18, he wrote out, for his own use, 110 maxims of civility and good behavior. In 1740, his elder brother, Captain Lawrence Washington, served under Admiral Vernon in the expedition against Carthage, and named his residence on the Potomac Mount Vernon, in honor of his commander, who offered George a commission as midshipman on his ship, which, but for the opposition of his mother, he would have gladly accepted. He then spent his time chiefly with his brother at Mount Vernon, and with Lord Fairfax, who owned great estates in the Virginia valley; and in 1748, he engaged to survey these wild territories for a double day, camping out for months in the forest, in peril from Indians and squatters. At the age of 19, at the beginning of the Seven Years' War, he was appointed adjutant of the provincial troops, with the rank of major; in 1751, he made his only sea voyage—a trip to Barbadoes—with his brother Lawrence, who

died soon after, and left George heir to his estates at Mount Vernon. At 22 (1754), he commanded a regiment against the French, who had established themselves at Fort Duquesne (now Pittsburg), and held Fort Necessity against superior numbers, until compelled to capitulate. The year following, when two regiments of regulars were led against Fort Duquesne by General Braddock, W. volunteered; and at the disastrous ambuscade of July 9, 1755, he was the only aide not killed or wounded. He had four bullets through his coat, and two horses were shot under him. The Indians believed that he bore a charmed life, and his countrymen were proud of his courage and conduct. Two thousand men were raised, and he was selected to command them. In 1759, he married Mrs Martha Custis, a wealthy widow, resigned his military appointments, and engaged in the improvement of his estates, raising wheat and tobacco, and carrying on brick-yards and fisheries. He was, like nearly all Americans of property at that period, a slaveholder, and possessed at his death 124 slaves, whom he directed, in his will, to be emancipated at the death of his wife (who survived him but three years), so that the negroes of the two estates, who had intermarried, might not be separated. He was for some years a member of the Virginia Assembly; and in 1774, though opposed to the idea of independence, and in favor of the union with Great Britain so ardently desired by all British Americans, he was ready to fight, if necessary, for the constitutional rights of the colonists. He spoke seldom and briefly; but Patrick Henry declared him to be, "for solid information and sound judgment, unquestionably the greatest man in the assembly." The news of the battle of Lexington (April 19, 1775) called the country to arms; and W., then a member of the Continental Congress, was elected Commander-in-chief by that body. He hastened to the camp at Cambridge; compelled the evacuation of Boston; was driven from New York; compelled to retreat across New Jersey; often defeated, and reduced to the most desperate straits, by disaffection, lack of men and supplies, and even cabals against his authority; but by his calm courage, prudence, firmness and perseverance, he brought the war, with the aid of powerful allies, to a successful termination; and (Dec. 23, 1783,) the independence of the thirteen colonies achieved, he retired from the army to Mount Vernon, which he had, during the eight years of the war, but once visited. He refused pay, but kept a minute account of his personal expenses, which were reimbursed by Congress. In 1784, he crossed the Alleghenies to see his lands in Western Virginia, and planned the James River and Potomac Canals. The shares voted him by the state he gave to endow Washington College, at Lexington, Va., and for a university. The Federation of States having failed to give an efficient government, W. proposed conventions for commercial purposes, which led to the Convention of 1787, of which he was a member, which formed the present federal constitution, considered by him as the only alternative to anarchy and civil war. Under this constitution he was chosen president, and inaugurated at New York, April 30, 1789. With "Lady Washington," so termed by the courtesy of the period, he presided over a federal court, far more formal and elegant than exists at this day, and made triumphal progresses in the north and south. During his second term of office, he was disgusted by the opposition of the Republican party, under the leadership of Jefferson and Randolph, and refusing a third election, he issued, in 1796, his farewell address, and retired to Mount Vernon. In 1797, when there arose a difficulty with France, threatening hostilities, he was appointed lieutenant-general and commander-in-chief. On the 12th of December 1799, he was exposed in the saddle, for several hours, to cold and snow, and attacked with acute laryngitis, for which he was repeatedly and largely bled, but sank rapidly, and died, December 14. His last words were characteristic. He said: "I die hard; but I am not afraid to go. I believed from my first attack that I should not survive it. My breath cannot last long." A little later he said: "I feel myself going. I thank you for your attentions; but I pray you to take no more trouble about me. Let me go off quietly. I cannot last long." After some instructions to his secretary about his burial, he became easier, felt his own pulse and died without a struggle. He was mourned even by his enemies, and deserved the record: "First in peace, first in war, and first in the hearts of his countrymen." W. was 6 feet 2 inches high, with brown hair, blue eyes, large head, and strong arms; a bold and graceful rider and hunter; attentive to his personal appearance and dignity; gracious and gentle, though at times cold and reserved; childless, but very happy in his domestic relations and his adopted children—nephews and nieces. His best portraits are those by Stuart, and the statue by Houdin at Richmond. He was an exemplary member of the

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Church of England.—See art. UNITED STATES; also Sparks's "Life and Writings of Washington," 12 vols. 8vo (Boston, 1834—1837); "Life of Washington," by Chief-justice Marshall, 5 vols. 8vo (Phila. 1805); "Life of Washington," by Washington Irving, 5 vols. 8vo (New York, 1855—1859); &c.

WASHINGTON, a territory of the U. S., in lat. 45° 30'—49° n.; long 117°—125° w.; bounded n. by British Columbia, e. by the territory of Idaho, s. by the Columbia River, which separates it from Oregon, w. by the Pacific Ocean. Estimated area, 69,994 square miles. Its capital is Olympia. Port Townsend is a flourishing site on Puget's Sound; and other new towns, with a multitude of mining villages and camps, are scattered over the territory. The chief rivers are the Columbia or Oregon, on the southern border, which also drains the whole territory east of the Cascade Mountains; the Okanogan, its great northern branch, flowing from the lake of the same name in British Columbia; Lewis or Snake River; and numerous streams emptying into Puget's Sound and the Pacific. W. is rich in sounds and harbors. Puget's Sound, from 1 to 4 miles wide, and 8 fathoms or more in depth, opens out of the Strait of Juan de Fuca, penetrating 100 miles into the heart of the country, and with its bays and islands forming one of the finest collections of harbors in the world. Hood's Canal, a narrower channel on the west, extends 60 miles. Bellingham, on the eastern shore of the Gulf of Georgia, has a tide of 29 feet. There are also large and deep harbors, suitable for naval stations, on the Strait of Juan de Fuca. The great range of Cascade Mountains, a continuation of the Sierra Nevada, passes through the centre of the territory from north to south, about 100 miles from the coast. Its chief summits are Mount Baker, lat. 48° 44', 11,990 feet, an active volcano; Mount Rainier, lat. 46° 40', 12,350 feet, an extinct volcano; Mount St Helen, 9550 feet, nearly extinct; Mount Adams, 9000 feet, entirely extinct. East of the Cascade Mountains, the soil is thin, rocky, dry, and sterile, but with fertile valleys; on the west, and especially around Puget's Sound, the soil is rich, and the country covered with a dense ever-green forest. West of the Cascades, the formation is of tertiary sandstone; near the Sound, the alluvium has a depth of 100 feet. Lignite, or tertiary coal, is found in many places. The mountains are granitic, and near Mount Adams is a large field of lava. East of the Cascade Mountains, the formations are igneous and metamorphic, with trap and volcanic scoria. There are rich gold-diggings in the north-eastern portion. The climate in the western district is almost precisely that of England, with a rainfall of 53 inches; east of the mountains there is but a quarter of the rainfall, and extremes of heat and cold. The timber in the western district is of great richness and abundance; the red fir and yellow fir (*Abies Douglasii* and *A. grandis*) growing 300 feet high, and 6 to 8 feet in diameter. The vegetable and animal productions are the same as in Oregon. Fish are very abundant, a dozen species of salmon filling all the streams, with halibut, cod, herrings and sardines in great quantities. The water and mountain scenery is among the finest on the continent. The chief product is timber, of which 250,000,000 feet were produced in 1875. Steam saw-mills on Puget's Sound and Hood's Canal saw 150,000 feet a day. Wheat, barley, oats, potatoes, and the hardier fruits, are produced in abundance. This territory was discovered by Juan de Fuca, a Greek, in 1592; visited by a Spanish navigator in 1776, and three years after by Captain Cook. In 1781, Berkeley, an Englishman, re-discovered the Strait of Fuca, which had been missed by others. Captain Gray, an American, visited the coast in 1791; and the English Captain Vancouver in 1792; Captains Lewis and Clark explored the interior during the presidency of Jefferson, and settlements were made by the Hudson's Bay Company in 1828; in 1845 American settlers entered the territory, then a part of Oregon. It was constituted a separate territory in 1853. Wars with the Indians in 1855 and 1858 retarded immigration, but in the latter year 15,000 persons were attracted by the discoveries of gold-diggings at Fraser's River, many of whom became permanent settlers. White pop. (1880), 67,199.

WASHINGTON CITY, the seat of the government of the U. S. of America, is

in the district of Columbia, on the left bank of the Potomac River, between Anacostia River and Rock Creek, which separates it from Georgetown, lat. $38^{\circ} 51'$, $20' N.$, long. $77^{\circ} 0' 15'' W.$, 85 miles south-west of Baltimore, 136 from Philadelphia, 203 from New York, 120 north-east of Richmond, 1203 from New Orleans, 2000 from San Francisco, 163 above the mouth of the Potomac, and 300 from the Capes of the Chesapeake. The Potomac at W. is one mile wide, and of sufficient depth for the largest vessels. The city was laid out under the direction of General Washington, on a handsome scale for the national capital, on a plateau 40 feet above the river, with several elevations, with streets from 90 to 120 feet wide, and 20 avenues, 183 to 100 feet. The principal edifices are the Capitol; the White House, residence of the president; Patent Office; General Post-office; Treasury, War, and Navy Departments; Smithsonian Institute (q. v.), &c. The Capitol, on the summit of a gentle elevation, in a pleasure-ground of 85 acres, was commenced in 1793, burnt by British troops in 1814, completed in 1825, and extended by the addition of two spacious wings in 1851; the centre is 352 feet by 101, with a lofty dome; the wings 149 by 233 feet; the entire building being 751 feet long, 824 deep, covering $3\frac{1}{2}$ acres—the centre of white sandstone, the wings white marble. The Rotunda, under the dome, contains several national pictures by Trumbull, Weir, Vanderlyn, Powell, Chapman, &c. The Senate Chamber is a noble hall, 112 by 82 feet, with galleries for 1000 spectators; the Hall of Representatives is 189 by 93 feet, with galleries for 1200. The old Senate and Representative Chambers, used before the enlargement, are beautiful rooms. The Congressional Library, 91 by 84 feet, contained in 1876, upwards of 300,000 volumes. The Capitol, containing also numerous committee-rooms and offices, is highly ornamented with rich marbles, frescoes, and groups of statuary. The buildings of the Treasury and State Departments, Post Office, &c., are massive and spacious. The saloons of the Patent Office, filled with models, are 1800 feet in length. A monument to Washington, intended to be 600 feet high, is one-third built. The city also contains numerous large hotels, 50 churches, a Roman Catholic and a Baptist college, three daily and several weekly newspapers, academies, schools, &c. The public buildings alone, however, are spacious and costly, the city in general having a scattered and mean appearance. During the War of Secession, from its exposed position, it was threatened with capture, and was surrounded by fortifications, and converted into an entrenched camp. Pop. in 1870, 103,102; in 1880, 147,203.

WA-SHITA, a river of the U. S. of America, rises on the western borders of Arkansas, and runs east and south-east through Louisiana, emptying into the Red River, 89 miles from its mouth; it is 500 miles long, and navigable to Camden, 800. Its chief branches are the Saline River, La Fouché, Tenness, and Little Missouri.

WASHOE SILVER MINES, a rich deposit of siliceous argentiferous galena, discovered in 1859 in a range of hills on the east side of the Sierra Nevada, on the borders of California and Nevada Territory, near the sources of Carson's River, 160 miles east by north of Sacramento. The ore produces as much as 2,000 dollars to the ton, and is largely exported to England. The discovery of these mines caused a great excitement in California, and a large emigration.

WASP (*Vespa*), a Linnean genus of insects, now forming the family *Vespidae*, a very numerous and widely distributed family, of the order *Hymenoptera* and section *Aculeata*. They are distinguished from all the other *Hymenoptera*, by their wings, when at rest, being folded throughout their entire length. The wings of all the wasps exhibit a similar pattern of nervation, with one marginal and three submarginal cells, and an incomplete terminal submarginal cell. Their antennae are usually angled, and somewhat club-shaped at the extremity. The maxillae are long and compressed; there are glands at the extremity of the labrum; the tongue is trifid, its tips lacinated. The body is naked, or but slightly hairy. The general appearance resembles that of bees; the color is usually black, with yellow markings. The division between the thorax and abdomen is very deep, the abdomen often stalked. The legs are not fitted for collecting pollen, like those of bees. The females and neuters have stings, generally more formidable than those of bees. The larvae have tubercles instead of feet. The wasps differ very widely in their habits, some being solitary, the family *Eumenidae* of some entomologists; others social, to which the name *Vespidae* is sometimes restricted. Neuters are only found among the social wasps.

Some of the solitary wasps make curious burrows in sand, or construct tubes of earthy paste on the sides of walls, in which they form cells for their eggs, at the same time placing there a store of food for the larvæ, some of them using for this purpose perfect insects, others caterpillars, which are stung so as to be rendered incapable of motion without being killed. Others make little earthen cells on the stems of plants, and store in them a little honey for their young. The social wasps have various modes of constructing their nests, which are sometimes formed in excavations in the ground, sometimes attached to walls, boughs of trees, &c., and formed of a paper-like, or sometimes a pasteboard-like substance, produced by mixing into a pulp, with their saliva, small particles of woody fibre, torn by their broad and powerful mandibles from gate-posts, palings, the bark of trees, &c. Great diversities are to be seen in the arrangement of the combs within the nest. The combs are made of a substance similar to the outer covering of the nest, but generally thicker and firmer. As the nest is enlarged, new paper is made for the purpose, the whole nest being enclosed in the last-made envelope, and the inner ones, which sufficed for its former size are removed to give place to combs. Several inner envelopes are generally found in a W.'s nest, so that paper-making must be a great part of the industry of these insects. The nests of the wasps of tropical countries are often very large, sometimes six feet long, and the communities very numerous. In colder regions, the increase of the community and of the nest is arrested by the approach of winter, when the males and the neuters die; but a few of the females survive, passing the winter in a torpid state in some retreat, and found new communities in spring. In a community of wasps there are many perfect females—not a single queen, as in the case of hive bees. Wasps in their perfect state feed very indiscriminately on a great variety of animal and vegetable substances, as insects, flesh, fruit, sugar, &c. Grapes or gooseberries, especially if over-ripe, are often found to contain a W. in the interior. Wasps often invade beehives and steal honey. There is a Brazilian species (*Myropetra scutellaris*) which stores up honey like bees. Wasps may be killed by pouring hot water on their nests; but more easily by the vapor of burning sulphur, when the nests are not in the ground; or ether or chloroform may be used to stupefy the wasps, so that the nest may be safely destroyed. The largest British species of W. is the Hornet (q. v.), found only in the south of England. The most abundant species, diffused over all parts of the country, are *Vespa vulgaris* and *V. media*. The former is about eight lines long. The front of the head is yellow, with a black centre; there are many yellow spots on the thorax and a yellow band with black points at the posterior margin of each ring of the abdomen; the rest is black. *V. media* is very similar, but rather larger. *V. vulgaris* makes its nest in the ground; *V. media* suspends it generally to the branches of trees, but some times to the projections of walls.

WASTE, in English Law, has several meanings. (1.) It means a common belonging to a manor, and by analogy is often applied to pieces of land of no great value, lying at the sides of highways or the seashore. The presumption is that a strip of land adjoining a highway belongs to the owner of the land next to it. (2.) Waste also means the spoil or destruction to houses, gardens, trees, or other corporeal hereditaments, committed by tenants for life or for years, to the injury of the remainderman or reversioner. Thus, he who has a life estate, or an estate for years, in a house or land, cannot change the nature of things, as by turning meadow into arable, nor wood into pasture, though he may better a thing of the same kind, as by draining the meadow, &c. The alteration caused by thus diminishing an inheritance is called waste, and its characteristics are to diminish the value of the inheritance, or to increase the burden upon it, or to impair the evidence of title. Waste is either voluntary or permissive. The former consists in the commission of acts which the tenant has no authority to do—such as pulling down buildings, felling timber, or opening mines. Permissive waste arises from the omission of acts which it is the tenant's duty to do—such, for example, suffering buildings to go to decay by wrongfully neglecting to repair them. There is, however, incident to every estate for life or years, the right to take estovers—that is, so much wood, stone, &c., as is required for use on the tenement, for repairs, husbandry, and the like purposes. It is a common practice, in family settlements, to provide that, in addition to this privilege, the estates of the tenants for lives shall be without impeachment for waste. The effect

of this clause is to enable the tenant to take timber, minerals, &c., covered by himself or others during the continuance of his estate. But even where the tenant holds without impeachment of waste, he is not entitled to cut down ornamental timber; and if he do so, a court of equity will restrain him by injunction. Wherever the tenant is committing acts of a character especially destructive to the inheritance, or still more, acts of wanton or malicious mischief, the Court of Chancery holds that his legal power to commit waste is belug used unconscientiously, and will restrain him.

WASTE LANDS, according to the general use of the term, are uncultivated and unprofitable tracts in populous and cultivated countries. The term waste lands is not employed with reference to land not reduced to cultivation in countries only partially settled. There is a large extent of waste lands even in the British Islands. Of the 77,800,000 acres which they contain, only about 47,000,000 are arable land and improved pasture; 2,000,000 acres are occupied with woods and plantations; 7,000,000 acres in Scotland consist of sheep pasture, generally at a considerable elevation, and little improved by art; 8,000,000 acres in Ireland are unenclosed pasture, generally quite unimproved; 8,000,000 acres are mountain and bog; and the remainder consists of unimproved and very unproductive land of other kinds.

The improvement of waste lands is very much a question of expense. It is often more profitable to improve lands already cultivated, and to bring them into a higher state of cultivation and productiveness, than to reclaim waste lands; in attempting which, much money has often been lost. Much of the cultivated land of Britain is far from having been brought to the highest state of cultivation of which it is evidently capable, or to a state equal to that of the best cultivated lands of similar soil and situation. In many instances, however, waste lands have recently been improved with great advantage, and it seems probable that no small part of the waste lands of the country are capable of profitable improvement. The process must often be slow and gradual, especially where the soil is naturally very poor, as even the addition of large quantities of manure to very poor soils will not render them fertile, but on the contrary will be followed by a sterility greater than before. The quantity of guano which a rich soil would gratefully receive, will destroy every vestige of vegetation on a very poor soil.

The waste lands of Britain are of very various character. Some of them are bogs, already sufficiently noticed in the article **Bog**. Others are marshes and fens, generally very near the level of the sea, and often within the reach of its tides, chiefly in the eastern counties of England. See **BEDFORD LEVEL**. Of these, a great extent has been reclaimed, and has become very productive; much still remaining, however, to be done. There are also extensive moors both in England and in Scotland, often of very poor soil, and often also at such an elevation above the level of the sea, as to render profitable agriculture hopeless. This is not the case with all the moors, and it is sometimes possible to effect great improvement by drainage; so that land, formerly almost worthless, may be converted into good pasture. In many places, the heath has been extirpated, and the moorland changed into good pasture, and even into good arable land. It is sometimes found very profitable to break up such land, even at very considerable elevations, and afterwards to lay it down in pasture, the produce being much greater than it was before. Even in the most elevated tracts, drainage is beneficial; although it must always be considered whether or not drainage will pay. The highest sheep-pastures of the south of Scotland have been greatly improved by a kind of superficial drainage (*sheep-drains*), consisting of mere open channels for water; but in the greater altitudes of the Highlands, and amidst their more rugged slopes, even this is out of the question. In some cases, chiefly of the more level moorlands, much improvement is effected by *paring and burning*, the surface being pared off by the *bread plough* or *paring-spade*, and burned, generally in heaps, of which the ashes are spread upon the soil. The application of lime is of great benefit in many cases, as is also that of chalk and of marl, but the expense must always be considered, and many tracts of waste lands are so situated that the application of such manures is impossible. Railways have rendered the reclamation of waste lands profitable in many districts, in which formerly it would not have been so.—The chalk downs of the South of England may, in great part, almost be considered as waste lands, although used for sheep pasture; but they have been found capable of great improvement,

although in a slow and gradual manner, by tillage, and the application of manures.—Sands near the sea-shore are fixed by sowing certain grasses (see *AMMOPHILA*), and are capable of further improvement by cultivation and the application of manures; particularly where the sand is in considerable part calcareous. The most barren and hopeless sands are those which are almost entirely siliceous. Some time ago a company proposed to experiment on a large scale on sand of this kind: by conveying the sewage of London to the Maplin Sands on the coast of Essex. Very different opinions were expressed by scientific men as to the probable result of the experiment, which was important both as to the reclamation of wastes and the disposal of sewage. Liebig deemed the siliceous sand incapable of profiting by the rich manure poured upon it. The company commenced their works, but failed to complete them.

WASTING PALSY is one of the terms applied to the disease described in this work under its old name of *TABES DORSALIS*.

WATCH, a small portable machine for measuring time, the construction of which is essentially the same as that of a clock (see *HOROLOGER*), except that the moving power is obtained from the elastic force of a coiled spring instead of from a weight, and the movement regulated, so as to be isochronous, by a Balance and Balance-spring (q. v.) instead of a pendulum. The going part of a watch consists of a train of wheels and pinions, kept in motion by a spring, called the main-spring; the last and fastest wheel of the train, the scape-wheel or balance-wheel, acting so as to keep in vibratory motion a balance whose movement, again—which is made isochronous by the action of another spring called the balance-spring—regulates to a uniform rate the revolution of the scape-wheel, and consequently the motion of the rest of the train, and the uncoiling of the main-spring.

The main-spring is a thin ribbon of steel coiled in a barrel. The inner end of it is fixed to a strong spindle, the axis or *arbor* of the barrel, around which it is coiled, and the outer end is fixed to the inside of the barrel. By its tendency to uncoil itself, the spring sets the barrel in motion, and it produces as many revolutions of the barrel as it makes turns itself in unwinding. As its elastic force is greater when it is tightly coiled than when it has to some extent unwound itself, the spring, if its force were applied without modification to the watch-train, would act upon it unequally, the power exerted diminishing as the spring uncoiled; so much so, that the watch could not go uniformly throughout the day, though it might keep time from one day to another. A piece of machinery, called a *fusée*, is employed to correct the variation in the force of the spring, and equalize the power exerted upon the train. The *fusée* is a cone with a spiral groove, connected with the barrel which contains the main-spring by a chain, one end of which is fixed at the broadest part of the cone, and the other end to the barrel. The barrel moves the *fusée* by means of the chain, which, as it runs off the sides of the *fusée*, is coiled upon the outside of the barrel. In winding a watch the key is placed on the axis of the *fusée*, and by the same movement the main-spring is coiled around its spindle, and the chain wound off the barrel, to cover the cone of the *fusée*. So when the spring is all coiled up, and its force upon the barrel is greatest, the chain is acting at the small end of the *fusée*, and its leverage upon the *fusée* is least; as the force of the spring diminishes, the chain having got to a broader part of the *fusée*, the leverage is increased; and the grooving of the *fusée* being, when perfect, arranged so that a section of the *fusée* along its axis would present two hyperbolæ placed back to back, secures that the force of the spring, modified by the leverage of the chain, shall produce a uniform motion of the *fusée*. From the *fusée* this motion is communicated to the watch-train, the first wheel of the train—called the *fusée-wheel* or the great wheel—being set upon the *fusée*. The *fusée* is introduced in almost all English watches; but a great proportion of foreign watches, and most French spring clocks, have no *fusée*, and have the great wheel fixed on to the barrel. Accurate time-keeping is not to be looked for from such clocks or watches; but it is said that many of the main-springs made upon the continent are so skilfully contrived, that the force is pretty constant during the whole time of unwinding.

Between the train of wheels and pinions in a watch and that of a clock, until we come to the escapement, there is no difference, except that there is one more wheel and pinion in the watch-train than in the clock-train; the reason of which is,

that the scape-wheel of a watch revolves, not like that of a clock, in a minute, but usually in about six seconds, making necessary an additional wheel to revolve in a minute and carry the seconds hand. A great variety of watch escapements are in use. The oldest, which is now going out of use, is the vertical escapement. It exactly corresponds to the crown-wheel escapement in clocks (see HOROLOGY). The vertical escapement is liable, though in a less degree, to the same objection as the old crown-wheel and the crutch or anchor escapements in clocks. There is a recoil of the scape-wheel after one of its teeth has been stopped by a pallet, which interferes more or less with the accuracy and uniformity of the motion of the train.

Almost immediately after the invention of the balance-spring, attempts began to be made to introduce an escapement which would produce greater accuracy than the vertical escapement. Hooke, Huygens, Hautefeuille, and Tompion introduced new principles, each of which has since been successfully applied, though they all, from imperfect execution, failed at the time. The first real improvement was made by George Graham, the inventor of the dead escapement in clocks. This is called the horizontal escapement; it was introduced in the beginning of the last century, and it is still the escapement used in most foreign watches. The impulse is given to a hollow cut in the cylindrical axis of the balance, by teeth of a peculiar form projecting from a horizontal crown-wheel. Other forms of escapement in high estimation are the lever escapement, originally invented by Berthoud, improved by Mudge; the duplex escapement, the principle invented by Hooke, the construction perfected by Tyrer; and the detached escapement of Berthoud, improved by Arnold and Earnshaw. The last mentioned is that which is employed in marine chronometers and in pocket-chronometers, as watches made in all respects like chronometers are called. The lever escapement is that which is used in most English watches. In it the scape-wheel and pallets are exactly the same as in the dead escapement in clocks. See HOROLOGY. The pallets are set on a lever which turns on their arbor, and there is a pin, in a small disc on the verge or arbor of the balance, which works into a notch at the end of the lever. The pin and notch are so adjusted, that when a tooth of the scape-wheel has got free, the pin slips out of the notch, and the balance is detached from the lever during the remainder of its swing; whence the name *detached lever escapement*, originally applied to this arrangement. On the balance returning, the pin again enters the notch, moving the lever just enough to send the tooth next in order to escape from the dead face of the pallet on to the impulse face; then the scape-wheel acts upon the lever and balance; the tooth escapes, and another drops upon the dead face of the pallet, the pin at the same time passing out of the notch in the other direction, leaving the balance again free. This arrangement is found to give great accuracy and steadiness of performance. To prevent the teeth from slipping away while the balance is free, the faces of the pallets are slightly undercut, and this makes them secure while at rest; moreover, there is a pin on the lever which moves through a notch on the balance disc, while the pin moves through the notch in the lever, which is so adjusted as to guard against the lever moving and the teeth escaping, while the balance is free.

In watches, even more than in clocks, variations of temperature, unless provided for, produce variations in the rate of going, the increase or diminution of the temperature affecting to some extent the moment of inertia of the balance and to a great extent the elastic force of the balance-spring. A rise in the temperature makes the balance expand, and therefore augments its moment of inertia; it adds to the length of the spring, and thereby diminishes its elasticity, the elastic force of a spring varying inversely as the length; and the time of vibration of the balance, which depends upon the moment of inertia directly, and upon the elastic force of the spring inversely, is increased—the watch, that is goes more slowly—in consequence both of the increase of the inertia and of the diminution of the elastic force of the spring. A fall in the temperature is attended by opposite results, the watch going more rapidly than before. A watch without a compensated balance would vary very much more than a clock without a compensation pendulum, but that being usually carried in the waistcoat pocket, it is kept at a pretty uniform temperature. To invent a satisfactory compensation was at one time the great problem for watchmakers. The compensation can obviously be made in either of two ways—by an expedient for shortening the effective length of the

balance-spring as the temperature rises so as to increase the elastic force of the spring; or by an expedient for diminishing the moment of inertia of the balance as the temperature rises, so as to correspond to the diminution of the force of the spring. The first method was that made use of by John Harrison (q. v.), who first succeeded in making a chronometer capable of measuring time accurately in different temperatures; but an adaptation of the other method, invented about eighty years ago by Earnshaw, is that which is always employed now. It is composed of two compound bars, of which the outer part is of brass and the inner part of steel, carrying weights, which may be screwed on at different places. The brass bar expands more with heat, and contracts more with cold than the steel bar; therefore, as the temperature rises, the bars, with their weights, bend inwards, and so the moment of inertia of the balance is diminished; as it falls, they bend outwards, and the moment of inertia is increased; and of course the diminution or the increase must be made exactly to correspond to the diminution or increase in the force of the spring.

The chronometer is just a large watch fitted with all the contrivances which experience has shewn to be conducive to accurate time-keeping—e. g., the cylindrical balance-spring, the detached escapement, and the compensation-balance. As a watch which will keep time in one position will often not do so equally well in another, marine chronometers are always set horizontally in a box in *Gimbals* (q. v.), an arrangement which keeps the chronometer horizontal, whatever the motion of the vessel.

The great importance of an accurate portable time-keeper at sea is for determining the Longitude (q. v.). This use was first distinctly pointed out by Sir Isaac Newton. A committee of the House of Commons, of whom this philosopher formed one, having been appointed on the 11th June 1714, to consider the question of encouragement for the invention of means for finding the longitude, the result of their meetings was a memorial containing an explanation of the different means proper for ascertaining the longitude, and recommending encouragement for the construction of chronometers as the best means of ascertaining it. An act of parliament was then passed, offering a reward for this purpose.

The first chronometer used at sea was invented by John Harrison. After many years of study it was completed in 1786. After several further trials and improvements, and two trial voyages to America, undertaken for the satisfaction of the commissioners, the last of which was completed on the 18th September 1764, the reward of £20,000 was finally awarded to Harrison.

Somewhat latter than this, several excellent chronometers were produced in France by Berthoud and Le Roy, to the latter of whom was awarded the prize by the Académie Royal des Sciences. Progress was still made in England by Arnold, Earnshaw (the inventor of the compensation still in use), and Mudge, to whom prizes were awarded by the Board of Longitude, and under whom a perfection nearly equal to that of the present day was obtained. The subsequent progress of watch-making has been chiefly directed to the construction of pocket-watches on the principle of marine chronometers, or to the combination of accuracy with convenient portability. The adjusted lever watch is now made in Clerkenwell with a degree of accuracy which enables the performance to be warranted within an error of one second a day.

While the compensation of a chronometer can never be made perfectly accurate for all degrees of temperature, there are always two temperatures at which a well-constructed chronometer will go with perfect accuracy. The explanation of this lies in the fact that while the variations of elastic force in the spring go on uniformly in proportion to the rise or fall of the temperature, the inertia of the balance cannot be made to vary as it should do, in exact correspondence to them inversely. The variation of the elastic force may be represented by a straight line inclined at some angle to a straight line divided into degrees of temperature; the corresponding changes of the moment of inertia will be represented by a curve, and this curve can coincide with the straight line representing the variations of elastic force only at two points, corresponding to two different temperatures. The particular points in the case of any chronometer are matter of adjustment. For instance, one chronometer may be made to go accurately in a temperature of 40°, and also in a temperature of 80°, at other temperatures being not so accurate;

another chronometer to go accurately at a temperature of 20° and of 60° . It is manifest that the former would be adapted to voyages in a warmer, the latter to voyages in a colder climate. Apparatus for testing chronometers have been long in use in the observatories at Greenwich and Liverpool. In the latter, there is now an extensive apparatus for this purpose, devised by the ingenious astronomer, Mr Hartnup. In a room which is isolated from noise and changes of temperature, the chronometers are arranged on a frame under a glass case, so contrived that they may be subjected in turn to any given degree of temperature. The rate of each under the different temperatures is observed and noted, and the chronometers registered accordingly. These observations are of the greatest importance both to ship-captains and instrument-makers, who can have their instruments subjected to the observations on payment of a fee.

It may be stated that the main-spring had been employed as the moving force of time-keepers for about a century before the invention of the balance-spring; but very little is known about the action of these forerunners of the watch. A watch without a balance-spring must have been a very rude and untrustworthy contrivance. The honor of first proposing the balance-spring is undoubtedly due to Dr. Hooke, though Huygens and De Hantefeuille also invented it independently much about the same time.—See Denisen's "Rudimentary Treatise on Clocks and Watches;" Wood's "Curiosities of Clocks and Watches;" Benson's "Time and Time-tellers" (1878).

WATCH, on Shipboard, a division of the crew into two, or if it be a large crew, into three, sections; that one set of men may have charge of the vessel while the others rest. The day and night are divided into watches of four hours each, except the period from 4 to 8 P. M., which is divided into two *dog-watches* of two hours' duration each. The object of the dog-watches is to prevent the same men being always on duty at the same hours.

WATCHING AND WARDING, in Scotch Law, mean the services rendered by one who holds lands under burgage tenure. These services are merely nominal.

WATCH-RATES, in England, are the rates authorised to be levied in a parish or borough under the Watching and Lighting Act; 3 and 4 Will. IV. c. 90, for the purpose of watching and lighting the parish.

WATER (symb. HO^* equiv. 9, spec. grav. 1), in a state of purity, at the ordinary temperature of the air, is a clear, colorless, transparent liquid, perfectly neutral in its reaction, and devoid of taste or smell. At a temperature below 32° it freezes, crystallizing in various forms derived from the rhombohedron and six-sided prism. See **ICE**; **SNOW**; **FUSING AND FREEZING POINTS**; **HEAT**. It appears from the researches of Arago and Fresnel, that notwithstanding the gradual dilatation of water below 39° , its refractive power on light continues to increase regularly, as though it contracted. Its density at 60° , and at the level of the sea, is taken at 1.000, and forms the standard of comparison for all solids and liquids, hydrogen being similarly taken as the standard of comparison for gases and vapors. Distilled water is 815 times heavier than air; a cubic inch weighs, in air at 62° , with the bar-

* During recent years Gerhardt's views as to the necessity of doubling the atomic weights of oxygen, carbon, sulphur, and a few other of the elements have been gradually gaining ground. Thus, the combining numbers of oxygen, carbon, and sulphur, instead of being 8, 6, and 16, are now fixed at 16, 12, and 32, and the corresponding symbols are indicated by a horizontal bar, which doubles the value of the symbol. According to these views, the symbol for an equivalent of water is H_2O , the latter symbol marked with a horizontal bar, or H_2O_2 , in place of HO , and the combining number is 18 in place of 9 (see **CHEMISTRY**).

† Although water is colorless in small bulk, it is blue like the atmosphere when viewed in mass. This is seen in the deep ultramarine tint of the lakes of Switzerland and other Alpine countries, and in the rivers issuing from them; and in the water in the fissures and caverns found in the ice of the glaciers, which, except on the surface, is extremely pure and transparent; and the deep blue tint of the ocean is doubtless due to the water itself, rather than to the salts dissolved in it.

ometer at 30 inches, 252·458 grains, and *in vacuo*, 252·722 grains, the grain being 1·7000 of the avoirdupois pound. See AVOIRDUPOIS, GALLON. For all practical purposes, water may be considered as incompressible; but very accurate experiments have shewn that it does yield to a slight extent when the pressure employed is very great; the diminution of volume for each atmosphere of pressure being about 51-millionths of the whole.—See MILLER'S "Chemical Physics," 2d ed. p. 41. Water evaporates at all temperatures, and under the ordinary pressure of the atmosphere, boils at 212°, passing off in the form of steam, which, in its state of greatest density at 212°, compared with air at the same temperature, and with an equal elastic force, has a spec. grav. of 0·625. In this condition it may be represented as containing, in every two volumes, two volumes of hydrogen and one volume of oxygen. See BOILING, STEAM, VAPOR.

Water is the most universal solvent with which the chemist is acquainted, and its operations in this respect are equally apparent, although on very different scales, on the surface of the globe and in the laboratory. This solvent action is usually much increased by heat, so that a hot aqueous saturated solution deposits a portion of the dissolved matter on cooling. Some substances are so soluble in water, that they extract its vapor from the atmosphere and dissolve themselves in it. Moreover, when water is heated in a strong closed vessel to a temperature above that of the ordinary boiling-point, 212°, its solvent powers are much increased. Pieces of plate and crown glass, acted upon for four months by water at 800° (in a steam boiler), were found by the late Professor Turner to be reduced to a white mass of silica, destitute of alkali; while stalactites of siliceous matter, more than an inch in length, hung from the little wire cage which enclosed the glass—an experiment illustrating the action which goes on in the Geyser springs of Iceland, which deposit siliceous sinter. All gases are soluble in water, but water dissolves very unequal quantities of different gases, and very unequal quantities of the same gas at different temperatures. Some gases are so extremely soluble in this fluid, that it is necessary to collect them over mercury. For example, at 32° 1 volume of water dissolves somewhat less than 1·50th of its volume of hydrogen, and exactly 1·50th of its volume of nitrogen, while it dissolves 506 and 1050 volumes of hydrochloric acid and ammonia gases; and while at 32° water dissolves 1·8 times its volume of carbonic acid, it dissolves only half that volume of the gas at 60°.

Water enters into combination with acids, bases, and salts. When an acid has once been allowed to combine with water, the latter can seldom be entirely removed unless by the intervention of a powerful base, which displaces the water, and allows of its removal by heat. For example, if sulphuric acid be largely diluted with water, and exposed to heat, watery vapor alone at first passes off; but as the temperature is raised to about 600°, a point is reached at which acid and water distil over together. The liquid at this stage of concentration is found to be composed of one equivalent of acid and one of water ($\text{H}_2\text{O}, \text{SO}_2$). The further separation of the water can only be effected by the addition of a base, as potash, oxide of lead, &c. Water which, as in this case, supplies the place of a base, is called *basic water*, and the compound is called a *hydrate*, or is said to be *hydrated*. Similarly, water combines with strong bases, such as potash and soda, and heat can only succeed in reducing a mixture of potash and water to a condition represented by one equivalent of each ($\text{H}_2\text{O}, \text{KO}$); and this last equivalent of water can only be removed by the addition of an acid. In this case, the water in combination with the base acts the part of an acid. These compounds also are *hydrates*. In these cases of acids and bases, the one equivalent of water cannot be removed without completely altering the chemical character of the body. (See, for instance, in the article SULPHURIC ACID, the difference between the properties of hydrated sulphuric acid and sulphuric anhydride.) In the case of many salts, however, a certain quantity of the water entering, so to speak, loosely into their composition may be expelled by heat without altering the properties of the salt. The water capable of being thus got rid of is called *water of crystallisation*, and is taken up by the salt in the act of crystallising. The form of the salt depends upon this water of crystallisation. In chemical formulae, this variety of water is represented by Aq instead of by H_2O . For example, in the formula for rhombic phosphate of soda— $2\text{NaO}, \text{HO}, \text{PO}_3 + 24\text{Aq}$ —the H_2O represents an equivalent of basic water, while 24Aq represents 24 equivalents of water of crystallisation.

It is less than a century since the ancient view, that water was one of the four

elements, has ceased to be believed in. It is now known that it is a compound of oxygen with hydrogen in the proportion of one equivalent of each. Hence its symbol is H_2O , and its combining number 9. When converted into vapor, 9 grains of steam occupy the bulk of 8 grains of oxygen at the same temperature; hence the combining volume of aqueous vapor is equal to 2, if the combining volume of oxygen be taken as 1. That water is such a compound as has been just stated may be proved either analytically or synthetically; and the subject is one of so great importance in the history of chemistry, that we shall enter rather more fully than usual into the consideration of these two modes of proof. The following simple mode of separating water by voltaic electricity into its constituent elements is borrowed from Fownes's "Manual of Chemistry:" "When water is acidulated so as to render it a conductor, and a portion interposed between a pair of platinum-plates connected with the extremities of a voltaic apparatus of moderate power, decomposition of the liquid takes place in a very interesting manner; oxygen in a state of perfect purity is evolved from the water in contact with the plate belonging to the copper end of the battery, and hydrogen, equally pure, is disengaged at the plate connected with the zinc extremity, the middle portions of the liquid remaining apparently unaltered. By placing small graduated jars over the platinum-plates, the gases can be collected, and their quantities determined. When this experiment has been continued a sufficient time, it will be found that the volume of the hydrogen is a very little above twice that of the oxygen; were it not for the circumstance of oxygen being sensibly more soluble in water than hydrogen, the proportion of two to one by measure would come out exactly. In lecture-rooms, an ingenious but more complicated apparatus, devised by Kopp, is commonly used to illustrate the electrolysis of water. It has been shewn by Mr. Grove that an extreme heat may, like electricity, be employed to decompose water into its constituents; and it is well-known that if, in the form of steam, it be passed over red-hot iron, it parts with its oxygen to the metal, while the hydrogen is given off as gas. The synthetical proof of the composition of water is afforded by passing pure hydrogen and oxygen, in the ratio of two volumes of the former to one of the latter, into a strong glass tube filled with mercury, and exploding the mixture by an electric spark, when the gases are replaced by a corresponding quantity of moisture, and the mercury is forced into the tube so as to fill it. The most satisfactory form of this synthetical proof is, however, afforded by reducing pure oxide of copper at a red heat by hydrogen, and collecting and weighing the water that is thus formed. The apparatus required for this experiment, and the method of employing it, are given in Fownes's "Manual of Chemistry," 9th ed., p. 181, and in Miller's "Inorganic Chemistry," 8d ed., p. 52.

Owing to its extremely solvent powers, the pure water which we have been hitherto considering is never found in nature. The nearest approach to a natural pure water is *rain-water*, after a continuance of wet weather; but even this water always contains in 100 volumes about 2.5 volumes of atmospheric air, with a trace of ammonia; and in point of fact, it seems impossible to obtain water which does not contain this ingredient, for, after two distillations, Professor Miller found from 1.85 to 2.88 volumes of air in 100 volumes of water. In addition to *rain-water*, the other *natural waters* may be included under the heads of *Spring water*, *Mineral Waters* (already considered in a special article), *River Water* (see **WATER-SUPPLY**), and *Sea-Water* (see below).

This article would be incomplete without a brief notice of the prolonged and acrimonious controversy that was for many years carried on, and is probably now hardly to be regarded as settled, regarding the respective claims of different philosophers to be the true discoverer of the nature and composition of water. In the year 1671, Cavendish made a long and careful series of experiments, which, unfortunately, were not published till January, 1784, when his celebrated Memoir entitled "Experiments on Air," was read to the Royal Society. In the interval (June 1763), his friend Dr. Blagden, visited Paris, and on the authority of Cavendish, gave an account of the experiments proving the composition of water to Lavoisier; and this delay between the discovery and the date of publication caused his claims to one of the most marvellous discoveries the world ever saw, to be contested by an English and a French rival, James Watt and Lavoisier. It may be briefly stated, that Cavendish's experiments consisted in exploding, in various proportions, mixtures of hydrogen and atmospheric air, and of hydrogen and oxygen, and finding as the result a liquid which

proved to be pure water. (Priestley and his friend, Mr. Warltire, had made similar experiments, and had noticed the deposition of moisture that followed the explosion but failed to recognise in it anything but the condensation of aqueous vapors in the gases.) The general conclusion to which Cavendish came was, in his own words, "that water consists of dephlogisticated air united with phlogiston," and as dephlogisticated air was his term for oxygen, and phlogiston his term for hydrogen, this statement corresponds to the modern view of the nature of water introduced by Lavoisier. As Lavoisier was from the first accused by the English chemists of having acted unfairly towards them, and as indeed his own claim only dates back to June 25, 1783, he may be dismissed from further consideration; and during the lives of the English claimants there were no public complaints on either side, although Watt, in private letters to his friends, hinted at Cavendish's incapacity and unfairness. Hence, then—at all events, in this country—scientific men were startled when Arago, then Secretary of the French Academy, published in 1833 the *Eloge* of Watt, which he had read as far back as December 1834, in which he charged Cavendish with deceit and plagiarism, inasmuch as he was said to have learned the composition of water, not by experiments of his own, but by obtaining sight of a letter from Watt to Priestley. The battle now fairly began, the first blow being struck in August 1835, when the President of the British Association, the Rev. Vernon Harcourt, in his opening address, vindicated Cavendish, and pointed out Arago's misstatement. At a subsequent meeting of the Academy, Arago, with Dumas to back him, defended his statements. Sir David Brewster (*"Edin. Rev."*, January, 1840) then sought to act as mediator; and the controversy, as might have been expected, went on with increased acrimony; and in the Summer of the same year, when the President of the British Association published the report he had delivered the preceding year he added a postscript, replying to Arago, Dumas and Lord Brougham (who had appended an "Historical Note on the Discovery of the Theory of Water," to Arago's *Eloge*). In 1841, Berzelius published what Dr George Wilson terms "a conditional judgment," in favor of Watt; and in 1845, in his "Lives of Men of Letters" see (*"Life of Watt,"* p. 400.) Lord Brougham followed on the same side. Dr Peacock (*"Quart. Rev."*, 1845, p. 105), in reviewing his book, assailed his conclusions, and asserted the claims of Cavendish. In 1846, Mr Harcourt (*"Lond. and Edin. Phil. Mag."*, Feb. 1846) also replied to Lord Brougham; and in 1847, in the second edition of his "History of the Inductive Sciences," Dr Whewell maintained his old conviction of the claims of Cavendish. In 1846 the publication of the "Correspondence of the late James Watt on his Discovery of the Theory of the Composition of Water," with an introduction by his kinsman, Mr Muirhead, who was editor, and a letter from his son, formed a most important addition to the literature of this controversy. Finally, the question was discussed, in 1847, by Sir David Brewster in the "North British Review," and in 1848, by Lord Jeffrey in the "Edinburgh Review," both of whom advocated the claims of Watt. As we have no space to discuss Watt's real claims, we may here state that Dr George Wilson, whose "Life of Cavendish" is in reality a strictly impartial history of the water controversy, maintains on very sound grounds that in reality Watt was informed of Cavendish's discovery through Priestley, as Lavoisier was through Blagden.

SEA WATER.—For an accurate knowledge of the composition of sea-water, we are mainly indebted to the investigations of Professor Forchhammer of Copenhagen. Not very many years ago, the only elements known to exist in sea-water, in addition to those constituting water itself, were chlorine, iodine, bromine, sulphur, carbon, sodium, magnesium, potassium, calcium, and iron. To these twelve must now be added, (13) fluorine, discovered by Dr George Wilson; (14) phosphorus, as phosphate of lime; (15) nitrogen, as ammonia; (16) silicon, as silica, in which form it is largely collected by sponges from sea-water; (17) boron, as boric acid; (18) silver; (19) copper; (20) lead; (21) zinc; (22) cobalt; (23) nickel; (24) manganese; (25) aluminium, as alumina; (26) strontium as strontia; (27) barium, as baryta. Several of these elements, however, exist in such small quantities that they can only be discovered indirectly, this is to say, in sea-weeds, marine animals, or in the stony matter deposited at the bottom of the boilers of oceanic steamers. The substances which, in respect of quantity, play the principal part in the composition of sea-water, are chlorine, sulphuric acid, soda, potash, lime and magnesia;

those which occur in less but still determinable quantity, are silica, phosphoric acid, carbonic acid, and oxide of iron. In the elaborate tables which are annexed to his paper, Forchhammer has always calculated the single substances (chlorine, sulphuric acid, magnesia, lime, and potash) and the whole quantity of salt for 1000 parts of sea-water; but beside this, he has calculated the proportion between the different substances determined, referred to chlorine = 100, and of all the salts likewise referred to chlorine. This last number is found if we divide the sum of the salts found in 1000 parts of any sea-water by the quantity of chlorine found in it; and he terms it the *co-efficient* of that sample of sea-water.* This chemist divides the sea into seventeen regions, his reasons for doing so being that he could thus avoid the prevailing influence which those parts of the ocean which are best known, and from which he has taken most observations, would exert upon the calculations of the mean number for the whole ocean. In reference to the *salinity* of the surface of the ocean, he has made the following observations. (1.) The mean salinity of the Atlantic between 0° and 30° n. lat. is 36.169 (i. e., this is the quantity of salts in 1000 parts of water); the maximum, which is also the maximum of the surface-water of the whole Atlantic, being 37.908, and occurring in 24° 15' n. lat. and about 5° w. from the coast of Africa, where no rivers of any size carry water from the land, and where the influence of the dry and hot winds of the Sahara is prevailing. This maximum is equal to the mean salinity of the Mediterranean, and is only exceeded by the maximum of that sea off the Libyan Desert, and that of the Red Sea. The minimum is 34.338 in 4° 10' s. lat., and 5° 36' w. long., close to the coast of Africa, where the large masses of fresh water which the great rivers of that region pour into the ocean exercise their influence. (2.) In the Atlantic, between 30° n. lat. and a line drawn from the north point of Scotland to the north point of Newfoundland, the mean salinity is 35.346, the diminution being due to the fresh water poured into it by the southern mouth of the St. Lawrence. (3.) In the Baffin's Bay and Davis' Strait region, the mean salinity is 33.281, and the salinity increases from latitude 64° towards the north, being in 64°, 33.926, and in 69°, 33.336. This peculiarity is owing (says Forchhammer) to the powerful current from the Parry Islands, which through different sounds passes into Baffin's Bay, where it is mixed with the great quantity of fresh water that comes into the sea from the West Greenland glaciers. Had this fact been known before the sounds that connect the Parry Archipelago with Baffin's Bay were discovered, it might have proved the existence of these sounds, because bays and inlets shew quite the reverse; the farther we get into them, the less saline the water becomes. (4.) From eleven observations on the Mediterranean between the Straits of Gibraltar and the Greek Archipelago, he confirms the old view of its great salinity; its mean salinity being 37.366, while that of whole ocean is 36.169. Its maximum (39.267) falls between the Island of Candia and the African shore; and its minimum (36.301) is at the Straits of Gibraltar. These results are due to the influence of Africa and its hot and dry winds. In salinity, the Mediterranean is only exceeded by the Red Sea, whose mean salinity is 43.067. (5.) The Black Sea, like the Baltic, is a mixture of salt and fresh waters. In three different experiments, the salinity varied from 18.146 to 11.880. At a distance of 50 miles from the Bosphorus, the proportions between chlorine, sulphuric acid, lime and magnesia, were 100 : 11.71 : 4.23 : 19.64, while the normal oceanic proportions are 100 : 11.89 : 2.36 : 11.07; thus shewing a relative increase in the lime and magnesia. (6.) As the Caspian Sea is considered by many geologists to have been formerly in connection with the Black Sea, the results of Mahner's analysis of its waters are given. The salinity varied between 56.814 and 6.236, and the proportion between the chlorine, sulphuric acid, lime, and magnesia, is 100 : 44.91 : 9.34 : 21.48, which differs extremely from the normal proportion. Thus the Caspian Sea, if it ever had any connection with the Black Sea, must have entirely changed its character since that time—a change which might be occasioned by the different salts which the rivers brought into it, and which accumulated there by evaporation of the water; or which might be caused by the deposition of different salts in the basin of the Caspian Sea itself. (7.) The Atlantic between 30° s. lat. and a line from Cape Horn to the Cape of Good Hope, is less saline than the corresponding re-

* We give these details because the term *co-efficient* will now doubtless be permanently retained by writers on the chemistry of sea-water.

gion north of the equator; and all the samples from the western part of this region have less, while the samples from the eastern part, nearer to the African coast, have considerably more sulphuric acid than the normal quantity. Does this, asks Forchhammer, depend upon the more volcanic nature of the west coast of Africa than the east American coast? (8.) In the sea between Africa and the East India Islands, the mean salinity is 33.983. The minimum (33.879) is from a place high up in the Bay of Bengal, and of course much influenced by the Ganges. It lies, however, about 800 miles from the mouth of that river; and another specimen taken 60 miles nearer the mouth has a salinity of 33.365, so that it would seem as if some other cause (possibly fresh-water springs at the bottom) had been in operation to weaken the sea-water at the minimum spot. (9.) In the Patagonian cold-water current, the mean salinity was 33.966; while three samples brought from the South Polar Sea, by the late Sir James Ross, had different salinities of 23.565, 15.598, and 37.513. Forchhammer cannot account for these discrepancies. All the specimens shewed a greater excess of sulphuric acid (12.47 in place of 11.83, as compared with 100 of chlorine), a result probably due to the volcanic nature of the antarctic continent. Forchhammer's analyses of waters from other of his 17 districts call for no remark; and the following are the general results of his investigations. "If we except the North Sea, the Kattegat, Sound, and Baltic, the Mediterranean and Black Sea, the Caribbean Sea and the Red Sea, which have all the characters of bays of the great ocean, the mean numbers are the following:

Sea-water.	Chlorine.	Sulphuric Acid.	Lime.	Magnesia.	All Salts.	Coefficient.
1000	13.999	2.258	0.556	2.096	34.404	1.513
	100	11.83	2.38	11.08		
Equivalents,	429	45	16	83		

Thus it is evident that the sea-water, in its totality, is as little a chemical compound as the atmospheric air; that it is composed of solutions of different chemical compounds; that it is neutral, because it everywhere in the atmosphere fluids carbonic acid to neutralise its bases, and everywhere on its bottom and shores finds carbonate of lime to neutralise any prevailing strong acid; that lastly, the great stability of its composition depends upon its enormous mass, and its constant motion, which occasions that any local variation is evanescent compared to the whole quantity of salt." It will be seen that the Atlantic is that part of the ocean which contains the greatest proportion of salt, while some of the bays in the tropical or subtropical zone (the Mediterranean and Red Sea, for example) have a greater mean than the Atlantic; that on approaching the shores, the sea-water, as might have been expected, becomes more diluted, and consequently less saline; that the polar currents contain less salt than the equatorial; that the polar current of West Greenland contains more sulphuric acid than the water in any other region except the East Greenland and south polar currents (while in the ocean at large, the chlorine is to the sulphuric acid as 100 : 11.83; in the south polar current it is as 100 : 13.58). As in the case of the West Greenland current, there is no neighboring volcanic region to account for this excess, Forchhammer suggests the absence of fucoidal plants, which have a great attraction for sulphuric acid, may have an influence in bringing about this result; * that most lime occurs in the ocean in the second region, the middle part of the Northern Atlantic; and the least in the West Greenland polar current (the quantities being 3.07 and 3.77 respectively.) Wherever, in other regions, the influence of land prevails, the lime also is in excess; thus, in the Black Sea, it was 4.521.

From these remarks on the surface-water, we pass on briefly to notice the

* In a paper read before the British Association in 1844, Forchhammer shewed that the fucus tribe has a great attraction for sulphuric acid, and that the acid, when the plant undergoes putrefaction, is reduced to soluble sulphides and to sulphuretted hydrogen, which, with the oxide of the iron of the plant, which is partly dissolved and partly suspended, will form sulphide of iron. Thus, the sulphur will disappear from the water. He suggests that the diminution of sulphuric acid which he found in the Atlantic, between the equator and 80° n. lat. (11.75 in place of 11.83), may be due to the action of the Sargasso Sea.

difference of sea-water in different depths. On this subject, the result obtained from the analyses of specimens of sea-water taken from different regions, is so contradictory, that we shall simply quote the sentence with which Forchhammer commences this department of his subject: "It would be natural to suppose that the quantity of salts in sea-water would increase with the depth, as it seems quite reasonable that the specific gravity of sea-water would cause such an arrangement. But this difference in specific gravity, relative to the increase in the quantity of salts, is counteracted by the decreasing temperature from the surface to the bottom. We have parts of the sea where the quantity of solid salts increases with the depth; in other parts, it decreases with the increasing depth; in other places, hardly any differences can be found between surface and depth; and lastly, I have found one instance where water of a certain depth contained more salt than both above and below. These differences are, to a great extent, dependent upon currents both on the surface and in different depths."—*Op. cit.*, p. 229. Sometimes, salinity of the surface water is the same as that of the deep: or one or more ingredients may vary in its proportions: for example, in the Mediterranean, while the deep water, generally, is richer than the surface-water in sulphuric acid, in some parts, as between Sardinia and Naples, the surface water is the richer in that ingredient. There are few observations on the specific gravity of the sea-water at different depths. For the following observations, we are indebted to Sir James Ross. "At 39° 16' s. lat., 177° 2' w. long., the specific gravity of the surface water was 1.0274; at 150 fathoms, 1.0272; and at 460 fathoms 1.0268; all tried at the temperature of 60° F., and shewing that the water beneath was specifically lighter than that of the surface, when brought to the same temperature: our almost daily experience confirms these results."—"Voyage," &c. vol. ii. p. 183.

The important questions—How did the salts which now occur in the sea come into it? Is it the land that forms the sea, or is it the sea that makes the land? Are the salts that are now found in sea-water washed out of the land by the atmospheric water? Has the sea existed from the beginning of the earth? And has it slowly but continually given its elements to form the land? And their answers constitute the last part of Forchhammer's most philosophical and laborious Memoir. The following is, in a condensed form, his reply to these questions. Suppose a river had its outlet in a valley, with no communication with the sea; the valley would be filled with water till its surface was so great that the annual evaporation was equal to the annual supply. There would then be a physical, but not a chemical equilibrium, because the annual loss would consist of pure water, while the received water would contain various mineral or saline matters, which would go on increasing till chemical changes would occasion precipitation of different salts. Now, in the water of the assumed river, we should find the basis prevailing in the following order—lime, magnesia, soda, iron, manganese, and potash; while the acids, similarly arranged, were carbonic, sulphuric, muriatic (chlorine), and silicic. Now, all these substances are found in sea-water, although in very different proportions. The ocean is, in point of fact, such a lake as we have here supposed, with all the rivers carrying their dissolved matters into it. "Why, then," our author asks, "do we not observe a greater influence of the rivers? Why does not lime, the prevailing base of river-water, occur in a greater proportion in the water of the ocean? In all river-water, the number of equivalents of sulphuric acid is much smaller than that of lime, and yet we find in sea-water about three equivalents of sulphuric acid to one of lime. There must thus be in sea-water a constantly acting cause that deprives it again of the lime which the rivers furnish, and we find in it the shell-fishes, the corals, the bryozoa, and all the other animals which deposit carbonate of lime." These animals not only deprive the water of its carbonate of lime, but they likewise decompose the sulphate of lime—a decomposition probably depending upon the carbonate of ammonia formed by the vital processes of these animals. The silica, which is always present in river-water, is appropriated by the varied sponges, diatoms, &c., and hence its scantiness in sea-water. With regard to the sulphuric acid conveyed into the sea, a small part enters into the composition of shells, corals, &c., and a greater part is attracted by sea-weeds, in which it undergoes reduction, as already described, while the balance remains in the sea-water. The magnesia of the river-water enters in small quantity into marine shells and corals, but only a small quantity is thus abstracted from sea-water, while the soda and

muratic acid, or chlorine, form, as far as we know, by the pure chemical, or organo-chemical action that takes place in the sea, no insoluble compound. "Thus," he concludes, "the quantity of the different elements in sea-water is not proportional to the quantity of elements which river-water pours into the sea, but inversely to the facility with which the elements in sea-water are made insoluble by general chemical or organo-chemical actions in the sea; and we may infer that the chemical composition of the water of the ocean has a great part is owing to the influence general and organo-chemical decomposition has upon it, whatever may have been the composition of the primitive ocean."

WATER-BED, called also the **HYDROSTATIC BED**, or **FLOATING MATTRESS**. It is well known that the life and health of every part of the animal body depend on the sufficient circulation through them of refreshed blood. See **CIRCULATION**. Now, when a person in health is sitting or lying, the parts of the flesh compressed by the weight of the body do not receive the blood so copiously as at other times; and if from any cause the action of the heart has become weak, the interruption will follow both more quickly and be more complete. A peculiar uneasiness soon arises where the circulation is thus obstructed, impelling to change of position; and the change is made as regularly and with as little reflection as the winking of the eyes to wipe and moisten the eyeballs. A person weakened by disease, however, while generally feeling the uneasiness sooner, as explained above, and becoming restless, makes the changes with increasing fatigue; and should the sensations become indistinct, as in the delirium of fever, in palsy, &c., or should the patient have become too weak to obey the sensation, the compressed parts are kept so long without their natural supply of blood, that they lose their vitality, and become what are called *sloughs* or *mortified parts*. These, if the patient survives, have afterwards to be thrown off by the process of ulceration, leaving deep hollows to be filled up by new flesh during a tedious convalescence. Many a fever or other disease, after a favorable crisis, has terminated fatally from this occurrence of *sloughing* on the back or sacrum. The same termination is common in lingering consumptions, palsies, spine diseases, &c., and generally in diseases that confine the patient long to bed.

It was to mitigate all, and entirely to prevent most of the evils attendant on the necessity of remaining long in a recumbent posture, that the hydrostatic bed was devised by Dr Nell Arnott, late one of the Queen's physicians. The bed may be shortly described as a mattress floating on water, with a loose sheet of caoutchouc cloth properly secured between it and the water, to prevent its being wetted. A person rests on it as a waterfowl does on its bulky feathers, with as little inequality of local pressure as if in a bath. A trough of the dimensions of a wide sofa or a bed, having six or seven inches depth of water in it, with the required caoutchouc covering, is the foundation, on which clothes and pillows are laid as in a common bed. A full description is given in Dr Arnott's book, the "Elements of Physics" (6th edition, Longman & Co.). The bed not only prevents the occurrence of bedsores, but by lessening antecedent distress, lessens also the danger of the illness.

On a sudden emergency, or when the need of the fluid support is not very urgent, local relief may be given by forming in any way a partial hollow or depression in a bed, and placing in it a water-sack or bag half-filled, so as to remain loose or slack. This approaches in effect the slack-sided cushion, which is another modification of the invention.

WATERBRASH. See **PYROSIS**.

WATER-BUDGET, a heraldic bearing in the form of a yoke with two pouches of leather appended to it, originally intended to represent the bags used by the Crusaders to convey water across the desert, which were slung on a pole, and carried across the shoulders. The Trusbuti, Barons of Wartre in Holderness, bore *Trois bouts d'eau*, three water-budgets, symbolizing at once their family name and baronial estate; and by the marriage of the heiress, similar arms came to be assumed by the family of De Ros, who bear gules, three water-budgets argent.

WATER-BUG, the popular name of a tribe or section of Heteropterous insects, *Hydrocorisæ*, which live almost entirely in water, and feed upon other aquatic insects. The anterior portion of the first pair of wings is horny; the antennæ are very small and concealed beneath the eyes. The *Hydrocorisæ* are divided into two

families, *Notonectidae*, and *Nepidae*. Of the former, the Boat-fly (q. v.) is an example. The *Nepidae* are popularly known as **WATER SCORPIONS**, from the form of their fore-legs, which are efficient instruments for seizing their prey. • Some of the *Nepidae* are powerful insects, two or three inches long.

WATERBURY, a township and city of New Haven county, Connecticut, U. S., 30 miles southwest of Hartford, on the left bank of the Naugatuck River, at its confluence with Great Brook and Mad River, whose falls furnish abundant water-power. It is a well-built town, with a fine park and ornamental cemetery, 7 churches, 2 banks, and 30 large manufactories of rolled copper, brass, German-silver, plated ware, pins, hooks and eyes, buttons, lamps, clocks, percussion-caps, &c. It has been built up by small mechanics, and is the head-quarters of the brass business in the United States. Pop. in 1870, 10,936; (1890) 17,606.

WATER CALTROPS. See **TRAPA**.

WATER CHESTNUT (*Marron d'Eau*), the name given in France to the edible seeds of the *Trapa natans* (see **TRAPA**).—The name Water Chestnut is also given to the edible tubers of the *Scirpus tuberosus*, a plant of the natural order *Cyperaceae* (see **BULBUSH** and **CYPERACEAE**), which is cultivated by the Chinese in tanks very abundantly supplied with manure. It is destitute of leaves, except a slender short sheath or two at the base of each culm. It is stoloniferous, and the tubers are produced on the stolons. They are in high estimation among the Chinese, both for food and as a medicine, and are eaten either raw or boiled. They are called *Pi-tai* or *Maa-tai*.

WATER-COLORS are painters' colors mixed with water and some adhesive material, as gum or size instead of oil. Those intended for drawings on paper are prepared with great care, and are usually formed into dry cakes with gum. Those for coloring walls and scene-painting are roughly prepared with glue or size. These are often called *Diatemper Colors*, from the Italian term *tempera*, applied to them to express their application to temporary purposes.

WATER-CRESS. See **CRESS**.

WATER-DOG, a kind of dog, of which the Poodle (q. v.) is regarded as a sub-variety. The head is rather large and round, the ears long, the legs rather short, the general form compact, the hair everywhere long and curly. The Water-dog of England, common before the poodle had been introduced from the continent, is still much esteemed by professional wild-fowl shooters, and by the fishermen of the north-eastern counties. It is about 18 or 20 inches high at the shoulder. The hair is coarser and crisper than that of the poodle. This dog was formerly sometimes used in London for the brutal sport of hunting and worrying domestic ducks, placed in a pond for the purpose. It is an intelligent and affectionate kind of dog, although not of much beauty.

WATER-DROPPWORT (*Oenanthe*), a genus of plants of the natural order *Umbelliferae*; having ovato-cylindrical fruit, not prickly nor beaked, each carpel with five blunt convex ribs, and single vittæ in the interstices; the calyx teeth lanceolate; the petals obovate and radiant, with an inflexed point; the partial involucre of many rays; the flowers of the circumference on long stalks and sterile, those of the centre subsessile and fertile. A number of species are natives of Britain, large perennial plants, with a strong and generally disagreeable aromatic smell, and compound or decomposed leaves. The Common W. (*O. Astuculosa*) and the HENLOCK W., or **WATER HENLOCK** (*O. crocata*), are both common in wet places in Britain and throughout Europe, and both are narcotic acrid poisons. The roots of the latter have some resemblance to small parsnips, and hence fatal accidents have frequently occurred.—The FINE-LEAVED W., called Water Fennel by the Germans (*O. phellandrium*, formerly known as *Phellandrium aquaticum*), is also common in ditches and ponds both in Britain and on the continent. It has a jointed root-stalk (*rhizome*), with tufted whorled fibres, and a strong zigzag stem dilated at the base. The leaves are decomposed. The fruit has a peculiar aromatic but disagreeable smell. It is not so poisonous as the other species just named. It was at one time erroneously regarded as a specific against pulmonary consumption; but it has been advantageously employed in pulmonary complaints.

Water
Waterford

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WATEREE, a river of the U. S., formed by the junction of the Catawba and Fishing Creek in North Carolina, runs south-east into South Carolina, where it unites with the Congara to form the Santee. Steamboats ascend the W. to Camden, 200 miles from the sea.

WATERFALL is a break in the continuity of the slope of the channel of a river or stream, so abrupt that the body of water falls from the higher to the lower level. Waterfalls occur most frequently in mountainous countries, where the streams from the mountain sides enter the valleys. It is only when the side of the valley is composed of hard rock that there can be a waterfall; in friable strata the stream wears out a ravine or side-valley. These mountain waterfalls, however, are generally rather curious and picturesque than grand, the volume of water being in most cases comparatively insignificant, though the height of fall is occasionally very great. All mountain waterfalls necessarily change their aspect from season to season—in winter, a roaring torrent plunging headlong into the abyss; in summer, often a mere film of water trickling down the face of the precipice. Waterfalls in comparatively level districts are not nearly so common, and their height of fall is insignificant compared with that of mountain cataracts; but the much greater volume of water, its steady and even flow to the precipice over which, in solid column, it descends with a thundering plunge, place such waterfalls among the grandest of nature's phenomena. It is where the course of a large river passes from a higher to a lower plateau, and where the upper plateau is edged with rock, that the grander cataracts are formed. If the rocks are of the same hardness from top to bottom, the edge of the escarpment, supposing it to be perpendicular at first, becomes worn off, and a slope or rapid is formed. But when the upper edge is hard and the under strata soft and friable, the reverberation of the spray wears away the softer parts below, leaving a projecting ledge at the top, which breaks off, piece by piece, as it becomes too much undermined, so that the fall is constantly receding. The question of the rate of regression of waterfalls has not hitherto occupied much attention, and has only been estimated in the case of Niagara, Bakewell giving its annual value at 1 yard, while Lyell limits it to about a third of this. Some of the most remarkable waterfalls in the world are the Yosemite, California, in a valley (see **YOSEMITE**) of the same name; a fall 2650 feet in entire height, but broken into three leaps; the Orco Falls at Monte Rosa, 2400 feet; Gavarule (Pyrenæes), 1400 feet; Staubbach (Switzerland), 1000 feet; Maanelvan (Norway), 940 feet; Niagara (q. v.); Zambezi (q. v.); Missouri. The cataracts of the Velino and Anio, in Italy, are beautiful artificial imitations of this most striking of natural phenomena.

WATER FLEA (*Daphnia*), a genus of *Entomostraca*, of the order *Cladocera*, and family *Daphniadæ*. One species, *D. monoculus*, is abundant in pools and ditches in Britain. It comes to the surface in the mornings and evenings, but keeps near the bottom during the heat of the day. It swims by taking short springs, whence its popular name. It feeds on minute particles both of animal and vegetable substances. It is a beautiful object for the microscope; the whole interior organisation being visible through the transparent carapace. The male is much smaller than the female, and comparatively rare. The eggs, after leaving the ovary, are retained in a cavity between the body and the carapace, until the young have attained almost their perfect form.

WATERFORD, a maritime county of the province of Munster, Ireland, is bounded on the n. by the counties of Tipperary and Kilkenny, on the e. by Wexford, on the s. by the Atlantic, and on the w. by the County of Cork. Its greatest length from east to west is 52 miles, and its breadth, north to south, 24; the total area being 721 sq. m., or 461,563 acres, of which 325,345 are arable, 105,496 waste, 23,483 in plantations, 526 in towns, and 5779 under water. The pop. in 1851 was 164,031; in 1861, 184,253; and in 1871, 123,310; of whom 116,859 were Roman Catholics, 5099 Protestant Episcopalians, and the rest Protestants of other denominations. The number of acres under crops of all kinds, in 1875, was 91,860, of which 12,995 were under wheat, 20,380 under oats, 16,319 under potatoes, 7838 under turnips, and 21,669 in meadow and clover. The live stock in 1875 consisted of 13,418 horses, 95,656 cattle, 60,720 sheep, and 49,215 pigs. The coastline extends from the estuary of the Suir, Waterford Harbor, to that of the Blackwater at Youghal, and is partly flat, partly rocky, but in general very danger-

ous for shipping. The rocky district contains some remarkable caverns. The surface is in general mountainous; the principal ranges being Knockmole-down, the Cummeragh, Monevolagh, and Drum. The Cummeragh Mountains are the loftiest, and abound in wild and picturesque scenery. The Suir (q. v.) and the Blackwater (q. v.) are the chief rivers. There are no lakes worthy of note. The climate is moist, and the soil, over a considerable part of the county, is marshy; but the upland districts are well suited for tillage, and the lower pasture lands, although inferior in fattening properties to those of the great central plain, produce excellent butter, which is exported in large quantities. In geological structure, the mountains present the old and new slate, separated by red and gray quartz rock and quartzose slate. Of quarry slate, there are two principal varieties, which are raised extensively for local use. The valleys belong to the limestone series, being an outlying prolongation of the great bed of the central plain. Lead, iron, and copper are found. The former two have proved unprofitable, but the copper-works at Bonmahon and Knockmahon have for many years been very productive. Marble of several colors and of considerable beauty is quarried near Cappoquin and Whitechurch, and potter's clay of good quality is found at Kildrum, near Dungarvan. The chief occupations of the population are pasturage and dairy-farming; but a considerable manufacture both of cotton and linen has been recently introduced at Portlaw, and the shipping trade has of late years become active and profitable.

W. is divided into eight baronies. The most considerable towns besides Waterford City (q. v.) are Dungarvan, Carrick-beg—properly a suburb of Carrick-on-Suir, which is in Tipperary—Lismore, Cappoquin, Tallow, and Tramore. Clonmel, although chiefly in Tipperary, lies partly within this county. W. returns five members to parliament—two for the county, two for Waterford City, and one for the borough of Dungarvan. The county constituency in 1877-8 was 8376. The net annual value of property in W., under the Tenement Valuation Act, is £268,047. This district, in common with the adjoining county of Wexford, is believed to have been anciently peopled by a Belgic colony. The Dunes also formed a settlement at the mouth of the Suir. From the date of the invasion, W. became a stronghold of the English, large grants having been made by Henry II. to the family of Le Poer; and in all the alternations of the subsequent struggle with the Irish population, it continued for the most part a firm centre of English influence. The county abounds with antiquities ecclesiastical and military, and of the Celtic and Danish, as well as the Anglo-Norman period.

WATERFORD, a city, capital of the county of the same name, but itself a county of a city, and a parliamentary borough, is situated in n. lat. 52° 16', w. long. 7° 8', on the river Suir, 12 miles from the sea, and 97 south-south-west from Dublin, with which city it is connected by the Great Southern and Western, and Waterford and Limerick Junction Railways, as also by the Waterford and Kilkenny Railway. The pop. in 1861 was 23,298, of whom 20,429 were Roman Catholics, and 1969 Episcopalians of the Protestant Church; and in 1871, 23,349, of whom 20,604 were Roman Catholics, 1861 Protestant Episcopalians, and the rest Protestants of other denominations. The city, with the exception of an inconsiderable suburb, with which it is connected by a bridge of 39 arches, 352 feet long, opening for the passage of ships, lies on the right bank of the Suir, along which a handsome and spacious quay extends for a distance of nearly a mile, and from which the city ascends gradually in well-built streets. Vessels of 2000 tons are now enabled to discharge their cargoes at the quay; but there is an anchorage for still larger ships about six miles lower down the river, at Passage. The chief public buildings are the Protestant and Roman Catholic cathedrals, the Protestant episcopal palace, the (Catholic) college of St John, the Model National School, and the city and county court-houses. In addition to the union workhouse, there is an infirmary, a dispensary, a fever hospital, a district lunatic asylum, and a penitentiary. The affairs of the municipality are administered by a mayor and corporation consisting of ten aldermen and thirty councillors; those of the port, by a body of commissioners, twenty-four in number, elected by the corporation and the Chamber of Commerce. The chief trade is with England, in the export of butter, pork, bacon, corn, flour, eggs and live-stock. The annual value of property under the Valuation Act is £36,401. Steam-navigation has received a great impulse, and there is now a ship-building yard, with patent slip, graving-bank and dock, on the Kilkenny bank of the river.

Water-Glass
Waterloo

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W. is originally of Danish foundation; but at the invasion, the city was taken by assault by Strongbow, by whom it was enlarged, and made a place of strength. It received a charter from John, which was forfeited under James I., but restored by Charles I. in 1626. But few remains of its ancient buildings are now to be seen.

WATER-GLASS, the soluble silicates of potash or soda, or a mixture of both. It is usually prepared by boiling silica with caustic alkali under pressure, about 60 lbs. to the square inch, in a digester. When pure and solid, it has the appearance of common glass, and is slowly soluble in boiling-water. A solution of water-glass is used, mixed with sand, &c., to form artificial stone. It is also spread on the surface of stone to protect it from decay, as it sinks in and cements the particles together; and it enters into the composition of some kinds of cement. In the art of Stereochromy, or Fresco-painting (q. v.), water-glass is now much used. It has also become useful in certain dyeing processes, having in some cases been found to answer the purpose of dunging.

WATER-HEN. See GALLINULE.

WATERLAND, Daniel, D.D., a clergyman of the English Church, prominent in the theological controversies of the first half of the 18th century. He was born on the 17th of February, 1683, at Waseley in Lincolnshire, of which parish his father was the rector. After going through the usual course of study at Magdalen College, Cambridge, he was admitted into orders; and in 1713 he became rector of Ellingham, on the nomination of the Earl of Suffolk. It was shortly after this that he published his first book, "Advice to a Young Student, with a Method of Study for the first Four Years"—an unpretentious but useful work, which soon became very popular, and brought its author into notice. King George I. appointed him one of his chaplains in 1717. About this period he began to be engaged in theological controversy, one of his earliest works being a criticism of a book by Dr. Whitby, in which a severe attack was made upon Bishop Bull's "Defence of the Nicene Creed." Whitby answered him; W. rejoined; and in 1719 the latter expanded his writings upon this subject into his "Defence of Christ's Divinity." This work was sharply criticised by Dr. Clarke and other Arians; to whom W. replied in a work published in 1724. Upon the same subject he, in 1720, preached and published a series of sermons at the request of the Bishop of London. Within a few years after this he passed through a rapid course of promotion in the Church. In 1721 he was appointed rector of the parish of St. Augustine in the City of London; in 1724 he got the Chancellorship of the Cathedral of York. He was appointed a canon of Windsor in 1727, and Archdeacon of Middlesex in 1728. He held along with the latter appointments the valuable living of Twickenham. During these years he was indefatigable in controversy; not only keeping up a paper war against the Arians, but entering the lists against free-thinkers, such as Middleton and Tindal, and against those of the Anglican body who did not share his doctrines upon the subject of the Trinity and the Eucharist. "A Critical History of the Athanasian Creed" (1724); "A Review of the Doctrine of the Eucharist" (1727); and "Scripture Vindicated" (1724), are considered among the most noteworthy of his productions. In 1738 were published two volumes of his sermons, edited by one of his friends—the one upon Justification, the other upon the Communion of Infants. W. died on the 23d December, 1740. A complete edition of his works, accompanied by a pretty full Memoir of his life from the pen of Bishop Van Mildert, was published at Oxford in 1833, in ten volumes 8vo; an eleventh volume, containing a general index, was added in 1835.

WATER-LILY, a name commonly enough given to the different species of *Nymphaea* and *Nuphar*, and also of *Nelumbium*, all genera of the natural order *Nymphaeaceae* (q. v.), and indeed often extended to all the plants of that order. Britain produces three species—*Nymphaea alba*, the White Water-lily; and *Nuphar luteum* and *Nuphar pumilum*, called Yellow Water-lilies. The two former are frequent in still waters in most parts of the island; *Nuphar pumilum* is more rare, and chiefly found in Scotland. All have heart-shaped leaves, floating on the water. The beautiful and fragrant white flowers of *Nymphaea alba* float upon the water; the flowers of the yellow water-lily, which are of comparatively little beauty, are raised by their stalks a little above it. The seeds of these, as well as of the Water-lily of the Nile (*Nymphaea lotus*—see LOTUS), are farinaceous, and are sometimes used

for food. The Turks prepare a cooling drink from the stems of *Nuphar luteum*.—The SWEET-SCENTED WATER-LILY of North America, *Nymphaea odorata*, has a large, white flower of great beauty, and of very sweet smell. Not only *Nymphaea lotus*, but also *N. rubra* and *N. pubescens*, are regarded as sacred plants by the Hindus. *N. caerulea* was also held sacred by the ancient Egyptians.

WATERLOO, Battle of, the decisive conflict which annihilated the power of Napoleon I., was fought, 18th June 1815, in a plain about 2 miles from the village of W., and 12 miles south from Brussels. Agreeably to the unanimous resolve of the Allies to attack Napoleon on all sides, and crush him as they had done in 1814, British and Prussian troops were stationed in the Netherlands, under the command of Wellington and Blücher respectively, in order to attack France on the north. Napoleon, on his side, well aware that for a considerable time no weighty attack could be made on France except by these forces, and fully recognising the immense advantage to be gained by destroying one enemy before the others could come up, rapidly concentrated the bulk of his troops; and with a suddenness and secrecy which defied all effective counter-preparations, crossed the Belgian frontier, and fell with one part of his forces on the Prussians at Ligny (q. v.), and with the other part, under Ney's immediate command, on the army of the Prince of Orange at Quatre-Bras (q. v.). The Prussians—as Wellington, after learning Blücher's dispositions for the battle, had foretold—were, after a contest of the most obstinate description, completely defeated; but the Prince of Orange, by the aid of the reinforcements promptly forwarded to him by the English commander, succeeded in withstanding Ney's attack. In the plan preconceived by the Allied generals such a result was not unforeseen, and in accordance with their scheme of firm resistance and retreat if necessary (to allow time for the Russians and Austrians to assemble on the eastern frontier of France), Blücher retreated northwards (instead of eastwards, as Napoleon expected) nearer the place of rendezvous with Wellington at Mont St Jean; while early on the morning of the 17th, the Anglo-Netherlanders retired along an almost parallel route till they reached the forest of Belgues, in front of which they were formed in battle array, facing southwards. Napoleon, imagining that the Prussians were in total rout, and that their complete dissipation would easily be accomplished by Grouchy's division (35,000 men), which he had sent in pursuit, crossed to Quatre-Bras with the rest of his troops, and uniting with Ney, marched in pursuit of Wellington, arriving on the plain of W. in the evening.

The two armies which then confronted each other, though nearly equal in strength, were composed of very different materials. The French army, numbering from 60,000 to 72,247 men (according to French authorities, English historians varying in their estimate from 74,000 to 90,000, though its exact strength cannot be ascertained, owing to the loss of the official returns), was composed of veteran troops, who had enthusiastically ranked themselves once more under the standard of the chief who had so often led them to victory. The Anglo-Netherlands army, which numbered 69,804, of whom only 25,880 were British, 6796 of the king's German legion, 10,995 Hanoverians, 6303 Brunswickers, 2926 Nassauers, and 17,468 Netherlanders, consisted, with the exception of a small number of Peninsular veterans, wholly of young soldiers, a large proportion of whom had never been under fire; the Hanoverians were only militia, some of them being fit but for garrison duty; while the behavior of many of the Belgian troops during the battle shewed plainly enough that they mainly increased the numerical strength of the army, as they left it to the Dutch soldiers to vindicate the wrongs of the Netherlands. The French had 240, while their opponents had only about 166 guns. With such an army, to maintain even a defensive conflict with an army of veterans, commanded by the greatest general of the time, was a task which (laboring under a mistake as to the exact superiority in number of his opponents) it required all Wellington's rare tenacity of purpose to undertake; yet undertake it he did, depending on Blücher's promise to join him an hour after mid-day.

On the morning of the 18th, the two armies found themselves ranged in battle-array opposite each other: the Allies, posted on a line of eminences, had their left wing resting on Frischermont, the farm-house of La Haye Sainte in front of their centre, while their right wing curved convexly round behind Hogomont, and rested on Braine Merbes. The French were ranged on a parallel row of eminences, having La Belle Alliance in their centre, with some divisions of cavalry and in-

faultry in reserve behind the right wing; Kellermann's dragoons behind the left wing; and the Guard, stationed with the 6th corps, in the rear. Skirmishing had continued all the morning; but the first serious attack was not made till between eleven and twelve, when a part of the 1st corps advanced against Hougoumont, with the view of masking the more important attack to be made against the allied left. This preliminary assault, however, though unsuccessful, was maintained with great vigor for a considerable time; till Napoleon, dreading a further loss of time, prepared to make his grand attack on the left centre. At this time (half-past one P.M.), he learned that the advanced guard of the 4th Prussian corps (Bulow's) was appearing in front of St Lambert, 2—3 miles to his right; and being forced to detach his 6th corps (Loban's) with the reserves of cavalry behind his right wing, to keep them in check, he had to modify his grand plan of attack on the Anglo-Netherlanders, and accordingly ordered Ney to break through their centre. At two P.M., after a furious preliminary cannonade, from which Wellington sheltered his men (as at various other times during the battle), by retiring them to the reverse of the slope. Ney advanced against the left centre with 20,000 men, but had only succeeded in putting to flight a Belgian brigade, when he was attacked and driven back by Picton's division, his retreating columns charged and broken by the English cavalry, and 2000 prisoners taken. Nevertheless, after a brief space, Ney returned to the charge, and carried La Haye Sainte, though his repeated attacks on the infantry in position were constantly repulsed, and his retreating columns severely handled by the British cavalry, who, disordered by success, were as often overthrown by the French cuirassiers. By this time (half-past four P.M.), Bulow had succeeded in deploying from the woods, and, advancing against Planchenoit, in the rear of the French right, carried it after a vigorous conflict. Loban's corps, however, aided by a reinforcement from the Guard, speedily retook the post, and driving the Prussians back into the wood, secured the French right flank for a time; Napoleon, though now learning that another Prussian corps (the 1st, under Zieten) was coming up by Ohain to join the Allied left, being still confident that he could destroy the Anglo-Netherlanders before the Prussians could render effective aid. During the conflict with Bulow, Ney had been warmly engaged with the centre and right of the enemy, who had made various attempts to regain the wood of Hougoumont and La Haye Sainte, and had supported his repeated attacks with not only his own cavalry, but (by, at any rate, the "tacit consent" of the Emperor) with the cuirassiers, lancers, and chasseur, of the Guard, and the whole of the mounted reserve, without, however, producing any result other than a great slaughter on both sides, and the useless sacrifice of 18,000 of the finest cavalry ever seen. Napoleon now resolved on another vehement assault on the immovable British centre, and directed against it in succession two columns, one composed of four battalions of the Middle Guard, and the other of four battalions of the Middle and two of the Old Guard, supporting them with flank attacks of other infantry divisions, of cavalry and with a dreadful fire of artillery. The advancing French were met with a well-sustained fire from every piece which could be brought to bear upon them; the first attacking column was fairly driven down the slope by the English Guards, and the second was totally routed by a bayonet-charge of Adam's brigade, the British cavalry following up the fugitives. Zieten had now (7 P.M.) joined the left of the English line; Bulow, further reinforced, had carried Planchenoit, and was driving the French right wing before him; and the combined attack on the retiring masses of the French by the whole effective force of the Anglo-Netherlanders on the one side, and of the Prussian cavalry on the other, converted an ordinary, though severe defeat into a rout unparalleled in history. The magnificent cavalry, wantonly destroyed by Ney in fruitless attacks upon an "impracticable" infantry, would then have been of incalculable service, but they were no longer to be had. The last square of the Guard still stood its ground, to protect the flight of the Emperor; but it was speedily surrounded, and on the soldier-like refusal of Cambronne to surrender, was in a moment pierced through, and broken to pieces. From this time all resistance was over; the roads southwards, especially that to Genappe, were crowded with fugitives fleeing for their lives from the pursuing cavalry; and though the English light cavalry, exhausted with their severe work during the battle, soon ceased the pursuit, it was kept up with great energy throughout the whole night by the Prussian troopers, who seemed bent upon at once avenging the defeats of Jena, Auerstadt, and Ligny, and

glutted their fierce animosity by an indiscriminate slaughter. The total loss in this battle was, from the obstinacy and determination with which it was contested, necessarily large; the figures are: British and Hanoverians, 11,678; Brunswickers, 687; Nassauers, 648; Netherlanders, 8178; a total of 16,186, which, added to 6999 Prussians, gives the aggregate allied loss, 23,185. The French had 18,500 killed and wounded; 7800 prisoners (some French accounts raise the total list of *hors de combat* to 32,000), and 227 cannon captured.

This great battle has given rise to numerous controversies among the British, French, and German historians of the great struggle between Europe and Napoleon—the points in dispute being, (1) as usual, the numbers engaged on each side, (2) the ability shewn by each general in his dispositions for the conflict, and (3) the relative share of the British and Prussians in producing the final result. These questions can be briefly and satisfactorily answered. The strength of the English army is known from official estimates; the French army, as shewn by its manœuvres throughout the day, was more numerous, and though its amount cannot, with perfect accuracy, be ascertained, it was certainly over 70,000, and under 80,000; but the fact that many Belgians in the Duke's army took to their heels as soon as the French marched towards them and fled direct to Brussels, increased the disproportion, already sufficiently great, between the two armies; the Prussians had only 85,000 men under fire at W., and half of these only for about half an hour. Fault has been found with Wellington for giving battle in front of a wood, but the accusation is foolish, as several good roads traversed the wood, thus affording means of retreat, if necessary, and the wood could have been held by skirmishers to protect the retreating infantry. Napoleon's faults were chiefly—the late hour at which he (not calculating on the arrival of the Prussians at all, and certainly not without Grouchy) commenced the conflict, and the reckless manner in which his cavalry reserves were wasted; and his neglecting to take into account the steadiness—a steadiness new to one of even his experience—with which, as he was warned by Soult, who knew it only too well, the British infantry were wont to maintain their ground. As to the third point, there is no doubt that Bulow's attack on Planchenoit distracted Napoleon's attention, and drew off 10,000 of his forces; but though the Prussians had not come up, the battle could not have been otherwise than a drawn battle; however, the effect of their successful attack on the French right, by taking in flank also the squadrons which recoiled before the invincible steadiness of the British, was the conversion of an otherwise drawn battle into a glorious victory. Each of the three nations claims its right to give name to this famous conflict—the French calling it after Mont St. Jean, a château in rear of the British line; the Prussians after La Belle Alliance; while the true victors on the bloody field assert their rightful claim, and will hand it down to all future ages as the *Battle of Waterloo*.

WATER MARK, the manufacturer's mark on various kinds of paper. See **PAPER**.

WATER MELON. See **MELON**.

WATER OUSEL. See **DIPPER**.

WATER-POWER. The value of water power depends much on the nature of the source of supply, whether steady or otherwise. Where streams supplying water-power are liable to fall off much in dry weather, large impounding reservoirs are necessary to keep the mills from being stopped during summer. These, however, being generally expensive concerns, are seldom made for one mill, but rather by some association of mill-owners; and often by a water company or commission for supplying a town with water, to afford compensation to the mills by storing up flood-water, for what is abstracted for the use of the town. On small streams, there is generally a pond provided fit to hold a night's water, or, perhaps, even a Sunday's, in addition; but in the case of large rivers, there is, in general, only a weir or dam across the river to direct the water into the intake lade. When the inclination in the bed of the stream is small, the lades require to be proportionally long, to give sufficient fall, and are often above a mile long or more from the intake to the lower end of the tail or discharge lade, where the water is returned to the stream. The rise and fall of the tide has been frequently used for driving water-wheels.

The most usual, and generally the most eligible, mode of applying water to the driving of machinery is by means of a vertical wheel; and the wheel is put in motion either by the water acting on blades or floats by impulse derived from its velocity acquired in falling, or by the weight of water being applied to one side of the wheel. The former mode of applying the water is generally adopted in low falls, say under six feet or thereabout, and to what is called an *undershot wheel*—i. e., a wheel where the effective head of water is below the level of the centre; and to make the application efficient, that portion of the periphery of the wheel measuring from the point of impact of the water to a point directly below the centre, requires to be surrounded by a casing generally of stone, but sometimes of cast-iron, called the *arc*, closely fitted to the extremity of the floats, so as to prevent any considerable escape of water.

The wheel, which may be either of timber or of cast-iron, or partly of both, consists of axle, arms, and floats, which are generally radii of the circle, but are sometimes set a little obliquely to the radius, pointing up stream, and generally there are also a sole, being a lining round the circumference at the lower edge of the floats, having openings for the escape of air, and a shrouding or circular plate at each side of the wheel, and of the same depth as the floats.

Sometimes when there is very little fall beyond the mere current of the stream, the floats simply dip into the water like the paddles of a steamer, in which case, no sole or shrouding is required; and to make allowance for the rise of the water in the tail-race during floods, which is generally called *back-water*, and seriously impedes and sometimes stops the motion of the wheel, occasionally the wheel and its arc are so constructed as to be capable of being raised or depressed together, without throwing the machinery out of gear. This is done in the case of the *Liverness water-works*, where the wheel is liable to be much affected by the rising and falling of the river *Neas*.

Sometimes, in this country, and often on the continent, the machinery is all on board a vessel moored in a river, so as to rise and fall with the level of the water, and thereby keep its water-wheel always immersed to the proper depth. At the old *London Bridge water-works*, the wheels which rose and fell with the tide were worked by the current of both the flood and ebb.

The other mode of applying the water to a vertical wheel by making it act by its gravity, is the more perfect and economical mode, where circumstances will admit of it, and is generally adopted in falls of any considerable height, say of six feet and upwards, and where the water can be let on above the level of the centre. The wheels are called respectively *breast* and *overshot wheels*, according as the water is let on more near to the level of the centre or to the crown of the wheel; and they have, instead of straight floats, curved or kneed buckets, according as they may be made of iron-plate or of wood, and of such a shape as to retain the water down to the lowest possible point. There are generally in good wheels ventilating openings in the sole for the escape of air. The overshot wheel has this disadvantage that, as the water has little or no power until considerably past the top centre, the wheel is burdened with a useless weight of water.

The direct overshot wheel has the water run, without changing its direction, right over the top; which arrangement has this advantage that, as the top of the wheel moves in the same direction as the stream, it gets the benefit of the whole initial velocity and impulse of the water; but, on the other hand, the bottom of the wheel, if at all immersed in water, which it generally is to some extent, meets with obstruction by moving against the current.

The *pitch-back overshot* is a modification of the last, making the water to pass alongside the wheel, and then to return and to be let on the top of the wheel in a contrary direction. This requires longer and more complicated troughs, and by the change in direction, part of the impulse from the water is lost, but the bottom of the wheel moves in the direction of the tail-water, and is not liable to be impeded by being immersed in it.

On the whole, it is generally thought better to apply the water at about 30 degrees from the top of the wheel. In such high-breast or nearly over-shot wheels, the water is let on to the buckets over the top of the sluice, which is made to open open by lowering, and shut by lifting. In this way, however small may be the quantity of water, it is always applied at the highest possible level, which is of

importance when it is its weight multiplied by the height of descent, and not its impulse, that yields the effective power.

The structure of the over-shot and breast-wheel is nearly the same as that of the under-shot, excepting in the substitution of curved buckets, or angular buckets, for straight floats; but even in the under-shot wheel the floats are sometimes made with a slight curvature.

In any description of wheel, the motion may be taken off the axle by torsion, which necessarily requires rigidity in the arms, or it may be taken directly off the periphery, when the power is applied to a pulion, working into segments either external or internal, attached to the shrouding. In this arrangement, there is no torsion of the axle, or transverse strain on the arms, and therefore the latter are more often made of round wrought-iron rods, with a slight axle. This wheel is much lighter than with the massive axle and the strong wooden or cast-iron arms, and is called a *suspension* or *spider wheel*.

In reckoning the power of water, its weight being $62\frac{1}{2}$ lbs. to a cubic foot; theoretically, 523 feet, falling vertically 1 foot a minute, would be equal to 1 Boulton and Watt horse-power of 33,000 lbs. lifted 1 foot a minute; but the effective power is far short of that, and 60 per cent. of it, requiring 880 cubic feet, falling 1 foot a minute, is generally reckoned a fair allowance for an effective horse-power. Seventy-five per cent., requiring 704 feet, falling 1 foot a minute, is about the highest that has ever been spoken of, and it is doubtful whether even more than 70 per cent. has ever been attained; while with low falls and imperfectly constructed wheels, it is often reckoned that a horse-power requires nearly 1000 cubic feet a minute.

The velocity of the periphery of an under-shot wheel is usually from 500 to 600 feet a minute, and that of a bucket-wheel, over-shot or breast, from 300 to 450 feet. It is seldom that the whole height of a fall can be advantageously made use of; for if the wheel be placed so low as to get the benefit of the whole height of the fall in low states of the water, very often it is liable in floods, to have the lower rim immersed, and to be obstructed or stopped by back water.

The most extensive application of water power to one work in Scotland, or probably in Britain, is that of Deanston Cotton Mills, on the river Teith, six miles above Stirling, where there are in one house four wheels, 36 feet in diameter, and 12 feet in breadth, and having a volume of water of $8\frac{1}{2}$ millions of cubic feet in $10\frac{1}{2}$ hours a day—falling 88 feet a minute. The most systematic application of water-power, however, is probably that of the Shaws Water-works, now the property of the corporation of Greenock. There the yield of nearly 7000 acres of hill-ground is stored up in reservoirs of a capacity of 830,000,000 of cubic feet, and conveyed by an aqueduct of about six miles in length to the outskirts of Greenock, which it reaches at the level of 519 feet above the level of the sea, and is then divided into two lines of falls, one having 1200 cubic feet a minute for 12 hours a day, and the other the equivalent quantity of 1066 feet for $18\frac{1}{2}$ hours a day, divided each into 19 falls, for which those already appropriated pay per annum from £1 15s to £4 8s. per horse-power, according to their distance from the centre of the town, and their height above its level. One foot of fall for each line is reckoned 1·8 horse-power, which is a very high computation, being 79·2 per cent. of the theoretical horse-power. At the "Cotton Mill," where both lines of falls are combined, there is the largest, or nearly the largest water-wheel in existence. It is 70 feet 9 inches in diameter, 13 feet wide, with 166 buckets, having a depth of 17 inches. It has 2266 cubic feet of water per minute, with a fall of 64 feet 4 inches, and is therefore nearly 200 horse-power. By the Shaws computation, it would be 218 horse-power. It is a spider wheel, taking the power off the circumference.

Of horizontal wheels: In the proper turbine (from Ital. *turbino*, a whirlwind), the water passes either, first, vertically down through the wheel between fixed screw-blades, which give it a spiral motion, and then strikes similar blades attached to a movable spindle, but placed in the opposite direction, so that the impact of the water communicates a rotatory motion to the blades and spindle; or, second, a modification of the foregoing is to pass the water from the centre horizontally outwards through fixed curved blades, so as to give it a rotatory or tangential motion, and thereby cause it to act on the blades of the wheel, which revolves outside.

In the reactionary wheel, which is in principle almost identical with Whiteaw

and Stirling's wheel, previously described under the article *BARKER'S MILL*, the water is admitted at the centre of the wheel from below, passes to the circumference between curved blades of the wheel, and escapes by tangential orifices at the circumference, there being valves made to open more or less, according to the quantity of water and to the power required.

The vortex wheel of Professor Thomson takes in the water after descending through the tubes, at the circumference, where, by means of fixed blades, it acquires a tangential motion, and then passes through between the curved arm of the wheel, and escapes at the centre. As the two last described wheels work always under water, they are not liable to be obstructed by back-water, or to have their power lessened thereby more than what is due to the diminished fall, and they are understood to yield a good percentage of power, sometimes stated at 75 per cent.; but all turbines are somewhat delicate, and liable to be choked by leaves or twigs, unless the water be carefully strained. Although only a few horizontal wheels have been described, their name is legion, and it would take a book to mention them all, or to describe their respective merits.

The reciprocatory hydraulic engine, works exactly on the same principle as the ordinary non-condensing steam-engine. The water, under considerable pressure, is admitted at one end of a cylinder, the exit valve at that end being simultaneously closed, while it is shut off from the other end, and the exit valve there opened; and so the alternating action of the valves and of the piston goes on continuously. To work smoothly and effectively, the piston ought to be of large diameter, in proportion to the length of stroke, and to go slowly; otherwise the quick jerking is apt to shake and to injure the engine; and generally it is better to have two cylinders and pistons working together, as that enables them to work more equally, and to turn the crank without the use of a fly-wheel.

Both the turbine and the reciprocatory engine have been made use of as water-meters.

The turbine and the reciprocatory engine have the advantage of being able to take the use of a fall much greater in height than the diameter of the largest wheel that can be made; but for all ordinary falls, a good breast or over-shot wheel, or even an under-shot, is, on the whole, generally considered better.

WATER-PROOFING. See *CAOUTCHOUC*. Besides the application of caoutchouc, peculiar methods have been employed to render cloth impervious to water, at the same time allowing the passage of air, the absence of this property in the impermeable caoutchouc manufactures having been found disadvantageous. Two plans are adopted for water-proofing woollen cloths, without rendering them quite impervious to air—the first is to dip the cloth into a solution of soap, and thoroughly rub it into the texture, after which it is dipped into a solution of alum; a decomposition of the soap and alum is effected, and the minute openings between the fibres are in some way partly filled so as to exclude water. In the second plan, the cloth is dipped into a solution of gelatine or isinglass, and afterwards in a solution of galls. A kind of tanning process is the result, the gelatine which has pervaded the cloth being rendered as insoluble as leather by its union with the tannin of the galls.

WATER-SPOUT. See *WHIRLWIND*.

WATER SUPPLY. Water is one of the primary wants of human life, no less essential than air and food; hence the strong and religious interest that has always been attached to the means of its supply. In the earliest records of civilisation, we read of the digging of wells, and of quarrels about the possession of them. The "Pools of Solomon," near Bethlehem, which remain now almost as perfect as when they were built, were connected with a scheme for supplying Jerusalem with water. In Assyria and Persia, from the earliest times, water has been conveyed to towns from astonishing distances in open channels or canals, and in subterranean tunnels, or *qanats*. In Egypt also, and in China, gigantic works for conveying water, both for domestic use and for irrigation, have been in existence from remote antiquity. Nor were these undertakings confined to the eastern hemisphere; we have evidence of the existence of kindred works in pre-Christian America. The ancient city of Mexico, which was built on several islands near the shore of the lake, was connected with the mainland by four

great causeways or dikes, the remains of which still exist. One of these supported the wooden aqueduct of Chapultepec, which was constructed by Montezuma, and destroyed by the Spaniards when they besieged the city. Hydraulic works on a great scale had also been executed by the Incas of Peru. Of all the ancient nations, the Romans paid the greatest attention to the supply of water, and carried the construction of *aqueducts* to the greatest perfection and magnificence. If we except the supply of New York from the Croton river (see *AQUEDUCT*), and that of Glasgow from Loch Katrine, the efforts to supply modern cities are as yet insignificant compared with those of the Romans. The last-named works, finished in 1855, convey 19 million gallons a day a distance of 36 miles. It is only since the beginning of the sanitary movement, occasioned by the repeated visitations of cholera beginning with 1833, that the subject of water-supply, and more especially the *quality* of water-supply, has seriously occupied public attention. The result of every inquiry and every day's experience has been to bring out more strongly the decided effects on the health of a community arising from the quantity and quality of the water at their command; and as the river and surface sources of supply near the chief seats of population are becoming every year more contaminated by Sewage (q. v.), the drainage from manured land, the droppings of animals, and the refuse of manufactures, enterprises and engineering skill must be directed either to procuring a supply of pure subterranean spring water from the chalk, or other absorbent strata, or to bringing pure water from greater distances than hitherto. In 1867, a royal commission was appointed to inquire into the condition of the water-supply of London; and numerous schemes were laid before them. Mr. Bateman proposed to utilise the high drainage-grounds of North Wales, from which the river Severn is supplied, having an area of 304 square miles. The water was to be conveyed for the most part in an open aqueduct, 17½ miles long, and capable of carrying 380 millions of gallons a day, to service-reservoirs on the high land near Stannmore, about ten miles from London, from which it was to be delivered, at high pressure, by means of pipes, to the whole city. The total cost was estimated at £11,400,000. On the ground of the distance, the committee reported against the proposal; as, on like grounds, they also did against a rival scheme for taking the supply from the Lake districts of Cumberland and Westmoreland. Owing to the exceptionally great rain-fall in these regions (140 inches on an average), it is calculated that the two lakes of Ullswater and Haweswater, with a drainage of 100 sq. m., receive together an average daily discharge of 550 million gallons. From this water, which is very free from mineral matter, there have been proposals to supply not only the metropolis, but the principal towns of the north-west of England—Liverpool, Leeds, Bolton, Blackburn, Huddersfield, &c. Of late it has been proposed to supply Manchester with water from Thirlmere. The Thames water has in some respects a superiority over the soft waters usually obtained from high gathering-grounds. It is well aerated, and keeps well. Recently, a covered conduit, 80 miles long, has been constructed, which conveys 8 million gallons of pure chalk spring-water from the sources of the Dhuis, in Champagne, to Paris; and operations are going on to bring the chalk springs of the Vanne, calculated to yield 22 million gallons a day, also to Paris, a distance of 104 miles.

The chief points of interest on this subject may be arranged under the heads of the Sources of Supply, the Qualities of Water, and the Arrangements for its Conveyance and Distribution.

Sources of Water.

The ultimate source of all *fresh* water is Rain (q. v.). When it has fallen on the earth, it presents itself chiefly in the form of surface-water, rivers, and springs.

Surface-Collection.—Rain-water, as it is formed in the upper regions of the atmosphere, is the purest that nature supplies; but in descending, it brings with it whatever impurities are floating near the surface, which, in the neighborhood of towns, are numerous, consisting of various gases, together with soot and other floating particles, organic and inorganic. Rain-water has a strong affinity for organic impurities—that is, the corrupting ingredients derived from vegetable and animal bodies, and which are diffused over every surface in the vicinity of living beings; hence, whence collected from the roofs of houses, it has a tendency to

rapid putrefaction. Being free from saline ingredients, it is excellent for washing, but is not generally pleasant to drink.

But if we resort to a barren district of rock or sand, destitute of vegetation, and remote from the pollution of towns, we may obtain water with comparatively little organic impurity. Notwithstanding several defects, it happens in various places that a surface-supply is the best that can be had.

Rivers.—The water obtained from running streams is in part what has flowed immediately from the surface, and in part the water of springs, shallow or deep. In any case, a considerable amount of contact with the ground has taken place, and in consequence saline and organic matter is liable to be dissolved in a greater or less degree. The extent of the impregnation, as well as the kind of material dissolved, will depend on the rocks and strata of the river-basin.

River-waters, besides the qualities they derive from their primitive sources, are apt to contain mud, decayed leaves, the exuviae of fish, and other matters in suspension, and are thus deficient in the clearness and transparency so essential to the satisfaction of the eye in a drinking-water. Moreover, the water partakes of the extremes of summer and winter temperature. But the great objection to water from rivers is their general pollution from the manure used upon the land, sewage and manufactures, so that there are now few rivers left from whose lower course a supply could be taken for domestic purposes. On the other hand, the supply from one of our large rivers is boundless and unfailing; and it conveys the surface drainage and spring effusions of a large tract of country, without incurring any trouble or expense as to the original sources. Rivers that issue from lakes are generally the purest, as the suspended matter has time to be precipitated.

Springs.—The qualities that recommend water to the eye and to the palate belong in a pre-eminent degree to spring-water (see *SPRING*): it is clear, sparkling, and of an agreeable and uniform temperature at all seasons of the year (about 50° Fahr.); it is well aerated, and is totally free from the offensive taint so common in all other waters, as well as devoid of the animalcules generated by organic impurity; and where a sufficient number of springs can be collected to suffice for a town, it is the most desirable of all sources of supply. Three-fourths of the water brought to Edinburgh is spring-water collected on the slopes of the Pentlands.

Quality of Water.

Perfectly pure water is hardly to be found; rain-water, and even artificially distilled water, are only approximates. The chief impurities may be considered under the heads of Mineral Matter in Suspension, Mineral Matter in Solution, and Organic Matter.

Mineral Matter in Suspension.—When running water comes upon a loose bottom, it carries the finer particles of sand and earth along with it. If the water comes into a position of perfect stillness, the matters thus floated gradually sink to the bottom again, with the exception of particles of clay, which, owing either to their excessive fineness or to their adhesive attraction for water, are incapable of being satisfactorily separated either by subsidence or filtration. Besides earthy matter, compounds of iron and lead are also in some circumstances present in a solid state, and may be got rid of by filtering. To separate clay-powder from water, the practice has long been resorted to in India and China of putting in a piece of alum, which seems to produce a kind of coagulation.

Dissolved Mineral Matter.—Spring-water, which is generally clear and sparkling, holding no solid matter in suspension, is seldom without a large amount of dissolved mineral matter, sometimes as much as 2 parts in 1000, commonly from 1 in 1000 to 1 in 50,000. River and surface water also contains more or less dissolved minerals (see *MINERAL WATERS*). The great bulk of the solid matter held in solution in ordinary waters consists of the salts of soda, potash, lime, and magnesia. The most material are the salts of lime and magnesia, as they are the causes of what is called "hardness" in water, which we shall speak of more particularly afterwards. The most important salt of lime is the *bicarbonate*, which is derived from chalk or limestone. Chalk or limestone is a *carbonate* of lime—that is, a compound of lime with one equivalent of carbonic acid—and is almost insoluble in water; but when water containing an excess of carbonic acid—as is the case with spring water especially—passes over limestone, it gives the carbonate a double dose of carbonic acid, and converts it

into bicarbonate, which is soluble. The waters having bicarbonate of lime for their chief impurity, are familiarly spoken of as the chalk-waters. The other salt of lime often present in water is the *sulphate* or *gypsum*. The important distinction between the bicarbonate and the sulphate lies in the fact, that the first, the bicarbonate, may be in great part precipitated, or thrown down in a solid, form, by boiling, which drives off the solvent carbonic acid; whereas the second, the sulphate, cannot be so precipitated. The chief effect of the boiling takes place in the first five minutes; but it may be increased by continuing it for fifteen minutes or even an hour.

Apart from its hardness, it has been made a question whether water containing salts of lime is injurious or not to the human constitution. Dr Lankester holds that there is evidence to prove that carbonate of lime in large quantity is positively injurious; and most physiologists are agreed that pure water is the best for securing the health of animals and man.

With regard to *magnesia*, its salts are well known to act as powerful medicines when taken in large doses, and it may be presumed are not altogether without effect in the small quantities existing in ordinary magnesian waters. A foreign physician has lately made the observation, that *magnesia* is the characteristic ingredient of waters in the districts where the diseases called *cratinism* and *goutre* abound.—Of salts of *soda* and *potash*, the principal is common salt or the muriate of soda. Sulphate of soda (Glauber's salt) occurs along with the muriate in the salt springs of watering-places as well as in the sea-waters. None of all these salts have any effect on the hardness. In the case of sea-water, which is very hard, the effect is not due to common salt, but to the lime and magnesian salts dissolved in it; were it not for these, sea-water would be perfectly suitable for washing, although not for drinking.—Salts of *iron* in considerable quantity make what are technically named *chalybeate* waters, which belong to the medicinal class. When the iron exists in the spring as carbonate, which is the most usual case, on exposure to the air, it is changed into the peroxide, and falls down in the form of an ochery precipitate. Salts of iron give an inky taste to the water, and a yellowish tint to linen washed in it.

Hardness in Water.—The quality of hardness in water is commonly recognised by the difficulty experienced in washing, and by the amount of soap necessary to form a lather. This quality is injurious also in the preparation of food; but its action is most universally felt in washing operations. It occasions the chapping of the skin, an enormous waste of soap, an extra labor, and a corresponding tear and wear of clothes. Every grain of chalk contained in water decomposes 10 grains of soap; and thus the hardening matter contained in 100 gallons of water, such as is supplied to London, will destroy 85 ounces of soap—that is, the first 85 ounces of soap added to this quantity of water will disappear without forming any lather, or having any cleansing effect. Soap is a compound, formed of an alkali (soda or potash) joined to an oily acid. When a salt of lime, then, is present in the water, the lime decomposes the soap, and combines with the oily acid to form a lime-soap, which is insoluble, and has no detergent properties.

The most usual hardening ingredients are the salts of lime. Salts of *magnesia* and of *iron* are also hardening salts. Salts of *soda* and *potash* have no hardening effect. Dr Clark, formerly Professor of Chemistry in Marischal College, Aberdeen, has devised a scale of hardness which is now universally employed in the chemical description of waters. The hardening effect that would be produced by one grain of chalk dissolved in a gallon of water is one degree of hardness; in like manner, four grains per gallon would produce four degrees of hardness; ten grains, ten degrees; and so on. The degrees are expressed in numbers—thus, 1°, 4°, 10°, 15°, are one, four, ten, fifteen degrees respectively. The degree of hardness of any particular water can be readily and exactly determined by Dr. Clark's Soap Test (q. v.).

Next to washing, the deleterious consequences of hardness are felt in various culinary operations, especially in the furring of boilers and cooking utensils, and in the infusion of tea. It is a fact of universal experience that hard water requires more tea than soft water to make an infusion of the same strength, and also renders the infusion muddy. Sub-carbonate of soda in crystals, by decomposing the earthy salts, improves the water; but if more is added than what will exactly decompose the earthy salts present, it injures the fine flavor of the tea. It may be stated generally, that for the purposes of washing and cooking, a water of less than 6° is soft, but above this point the hardness becomes objectionable. At 8°, the water is moder-

ately hard; at 12° , it is very hard; at 16° , the hardness is excessive; and much above this, it is intolerable.

To make these observations more intelligible, we may mention a few instances of known waters, with their place in the scale. In Keswick, the water is under half a degree of hardness; in Lancaster, it is $1\frac{1}{2}^{\circ}$; and in Manchester 2° . The water of the Dee at Aberdeen, which is used for the supply of the town, is $1\frac{1}{2}^{\circ}$ of hardness. The water of Loch Katrine is of remarkable purity, having only two grains of solid matter of all kinds in the gallon, and 1° of hardness. The waters of the Welsh mountains, from which it is proposed to supply London, have on an average less than 2° . The river Clyde, which formerly supplied Glasgow, is $4\frac{1}{2}^{\circ}$, and may also be reckoned a soft water. The Thames at London, as well as the New River, is about 14° , while many of the tributaries of the Thames rise as high as 16° ; but being all chalk-waters, they may be materially softened by boiling. Springs from the chalk commonly range from 16° to 18° ; but particular springs are to be met with in some parts of the world four or five times as hard, from the presence of bicarbonate of lime. The water of the Treasury pump in London has from 50° to 60° of hardness. In many parts of the continent, hard waters abound; but the testing of waters has not been so much attended to there as in this country.

The evidence laid before the Royal Commission above referred to went to prove that there is no reason whatever to suppose that the hardness of the Thames water, which averages about 15° , would be in the least degree prejudicial to health. It appears that the hardness of springs is generally considerable; and that surface-waters may be collected in a state that is to be considered soft (4° - 24°).

Lead in Water.—Injurious effects have frequently arisen from the contamination of water with lead, derived from leaden pipes and cisterns. Some kinds of water are known to act powerfully on a leaden surface, and others scarcely at all; but the qualities and circumstances on which the action depends have never been satisfactorily determined. Distilled water, and soft lake and river waters in general, act most decidedly, but by no means in proportion to their softness. The presence of air in the water seems one essential condition; light also increases the action, as does the presence of vegetable matter; it has been observed that when leaves drop by chance into a lead cistern, the spots where they lie become visibly corroded. The water of Loch Katrine, according to extensive sets of experiments by distinguished chemists, is allowed to have an intense action* on lead under certain circumstances—viz., "1st, If the lead be bright and highly polished; and 2d, If the lead and water be freely exposed to the access of air." But it "does not exert any noxious action on lead when the metal is in its ordinarily dull state." The coating formed on the surface of the metal is held to protect it from further chemical action. Still there are opposing facts to shew that this protective action is not always to be relied on; and that water that has passed through any considerable length of lead pipe, or stood for some time in a short one, or in a cistern, should never be used without care; a ninth part of a grain of lead per gallon has been known to derange the health of a whole community. Dr Clark made the unexpected discovery that sand-filters completely separate the lead.

Organic Impurities.—The contamination of water by vegetable and animal substances takes place in various ways. The most obvious and abundant source of this class of ingredients is the sewage and refuse of towns; and next in order may be ranked the contact with soils rich in organic matter. Among organic impurities may be classed offensive gases, such as carburetted, sulphuretted and phosphuretted hydrogen; vegetable fibres in a state of rotteness; putrefying products of the vegetable or animal kingdoms; starch, muscular fibre, &c.; urea and ammoniacal products; vegetable forms—algæ, confervæ, fungi, &c.; animalcules—infusoria, entomostracæ, annelidæ or worms, &c. Water falling on a growing soil, and running off the surface to lie in stagnant ponds, is in very favorable circumstances for being tainted with vegetable and animal life. Water-plants will spring up and feed numerous tribes of animalcules, and each pool will be a constant scene of vitality. In such

* The water of Loch Katrine is remarkably well aerated, having $1\frac{1}{2}$ cubic inches of air per gallon, of which $2\frac{1}{2}$ inches are oxygen. Dr Clark has a suspicion that the oxygen may turn out to be in some different state or modification from common oxygen.

a state, the water is usually unfit for drinking; the palate instantly discerns a disagreeable taste, and no one will use it who can do better. The surface-water of a district overgrown with peat-moss has usually a peaty flavor, as well as a dark and dirty color. The infusion of peat does not breed animalcules, being a strong antiseptic; but it is an objectionable ingredient, nevertheless. Very slow filtration has been found to remove the color of the infusion in some degree, but not entirely. Lime removes the peat most effectually, but there is both expense and risk in applying it. It is, perhaps, doubtful whether any specific unwholesomeness can be justly attributed to peat-water; but it is unpalatable, and the use of it is shunned by the inhabitants of peaty districts, and even by cattle. The presence of peat in the lands used as collecting-grounds for surface-water—and it is generally such worthless tracts that are so employed—is a disadvantage attending that mode of supply.

Chalk-water, which, as it issues from a spring, is perfectly free from organic matter, has a source of contamination within itself. When exposed to light and air, the duplicate dose of carbonic acid that keeps the chalk dissolved, becomes decomposed; and the carbon of the decomposed acid gives rise to a green vegetation, which soon acquires an offensive smell.

Organic matter in a putrefying state forms the worst kind of contamination that water can have. Though we may not know the precise effects of these impurities on the animal system, the single fact of their rendering the water repulsive to the taste and nauseous to the stomach would be sufficient to condemn their use. What is disagreeable to the senses, must be presumed to be unwholesome in addition, until the contrary is proved. Though no one has ever yet gone the length of maintaining, as a general truth, the wholesomeness of water abounding in vegetation, insects, and decaying matter, yet the water of the Thames, even within the influence of the tides, where it is contaminated by the whole sewage of the metropolis, found defenders until lately, on the plea that the amount of impurity was too small to do harm. This ground is at length given up; but Thames water above Teddington Lock is still sanctioned as safe water for the companies to supply to the inhabitants of London, notwithstanding the sewage of the numerous populous towns that the river receives above that point. As to this plea of smallness of amount, the highest medical authorities hold that it is impossible to say how small a quantity of organic matter in a state of fermentation may not do harm. We are not, however, left merely to presume that organic impurity in water is prejudicial to health. During the cholera visitation of 1858—1854, a gigantic experiment was undesignedly made on half a million of human beings. It so happened that a certain district of London was supplied by two rival water companies, the two mains running often side by side, and some houses taking water from the one, and some from the other. The whole inhabitants were living alike in all respects save one—viz., that one company drew its water from high up the Thames, where it was of comparative excellence, while the other drew its water from low down the river, where it was profusely contaminated with town drainage. Among this population, there were more than 4000 deaths from cholera; and when the epidemic had subsided, an inquiry was made, house by house, as to those deaths, and as to the water-supply of the several houses where they had occurred. The inquiry was conducted with every precaution, to avoid sources of fallacy; and the result was this: in the one set of houses, the mortality per 1000 of the population was 37; in the other set of houses it was 180—that is to say, the cholera death-rate was $3\frac{1}{2}$ times as great in the one set as in the other.

It is a common notion that *every drop of water teems with life*; but this is a mistake. Deep wells, and spring water in general, contain little or no living organic matter. Consequently, it is quite possible to obtain a liquid perfectly free from animalcules and vegetation. The presence of living creatures, vegetable or animal, discernible either by the naked eye or by the microscope, is a proof of organic taint in the water, and is one of the tests of this kind of impurity. With respect to rain-water, Dr Hassall states, in his evidence before the General Board of Health: "I have made several examinations of rain-water immediately after its descent to the earth, obtained in both town and country, and can confidently assert that it does not, in general, contain any form of living vegetable or animal matter." The conditions necessary for the development of vegetation and animalcules over and above the presence of matter for them to feed on, are *air*, *light*, and *stillness*. With regard to

the probable effects on health of living creatures contained in water, Dr Hasenl's observations are worthy of attention: "All living matter contained in water used for drink, since it is in no way necessary to it, and is not present in the purest waters, is to be regarded as so much contamination and impurity—is therefore more or less injurious, and is consequently to be avoided. There is yet another view to be taken of the presence of these creatures in water—viz., that where not injurious themselves, they are yet to be regarded as tests of the impurity of the water in which they are found."

Means of Purifying Water.

The mechanical impurities of water, or the solid particles rendering it muddy or milky, may in most cases be removed by mechanical means. The two processes for this purpose are *subsidence* and *filtration*. The effects of subsidence are strikingly seen in the case of rivers that pass through lakes. See GENEVA, LAKE OF. The subsidence of solid particles depends on their own weight, as compared with the weight of an equal bulk of water. To favor the process, the most perfect stillness should be allowed. It is expedient to have partitioned placed in, the subsiding reservoirs at short intervals, more effectually to prevent the agitation of the water. The water should be run off from the top, and not from the bottom. By making the bottom of the subsiding reservoir form a declivity from opposite sides, and providing means to let off the water occasionally from its lowest depth, it is possible to get quit of the subsided mud. It is always found of advantage in clearing water from solid particles, whether by subsidence or by filtration, to mix together streams of different qualities.

In constructing an artificial filter on a large scale, a basin is formed, having the floor nearly level, but slightly inclining towards a centre line, and made water-tight by puddling the bottom and sides with clay. On the floor is laid a series of layers of gravel, coarse at first, and getting gradually finer upwards; next, a layer of slate-chips or sea-shells, then one of coarse sand, on which is placed the actual filtering layer of fine sand. The depth of this layer is from twelve to thirty inches, that of the entire mass from four to six feet. The water being admitted gently on the top of the sand, sinks down and is conducted by a series of channels, generally of tile-pipes, into the main drain. A filter in a clean state will pass from twelve to eighteen vertical feet of water in twenty-four hours. The solid matter intercepted does not penetrate more than three-fourths of an inch into the sand, so that, by removing a very thin film from the surface, the filter is again clean. What is scraped off the top, is capable of being washed and put again to use. "This process of filtration," says Professor Clark, "is efficacious in removing mechanical impurities to an extent that could scarcely be believed without seeing the process."

The cleansing power of sand can hardly be accounted for on the theory of mere mechanical interception. Though there is no chemical action, strictly speaking, there is no doubt that the attraction of adhesion is at work—a power that plays a greater part in natural processes than has generally been assigned to it. Some substances manifest this adhesive attraction more strongly than sand, and have therefore still greater efficacy as filters; though practically, and on the large scale, sand is the most eligible. Powdered charcoal has long been known as a powerful filtering medium, attracting and detaining especially organic matter. Animal charcoal, or that derived from burning bones, is still more efficacious than wood charcoal. A filter of animal charcoal will render London porter almost colorless.

According to recent researches, it would seem that loam and clay have similar properties, and may be made available as filters. Professor Way states that "they have powers of chemical action for the removal of organic and inorganic matters from water to an extent never before suspected." The filthiest liquids, such as putrid urine and sewer-water, when passed through clay, dropped from the filter colorless and inoffensive. The clay used was that known as pipe-clay.

For filters for domestic use, see FILTER.

Softening of Water rendered Hard by Chalk—Clark's Process.—This is one of the most beautiful applications of science to the arts of life that could perhaps be named. We extract the inventor's own account of it, as given in a paper read before the meeting of the Society of Arts:

"In order to explain how the invention operates, it will be necessary to glance at the chemical composition and some of the chemical properties of chalk; for while

chalk makes up the great bulk of the matter to be separated, chalk also contains the ingredient that brings about the separation. The invention is a chemical one for expelling chalk by chalk. Chalk, then, consists, for every 1 lb. of 16 oz., of lime, 9 oz.; carbonic acid, 7 oz.

"The 9 oz. of lime may be obtained apart, by burning the chalk, as in a lime-kiln. The 9 oz. of burnt lime may be dissolved in any quantity of water not less than 40 gallons. The solution would be called lime-water. During the burning of the chalk to convert it into lime, the 7 oz. of carbonic acid are driven off. This acid when uncombined, is naturally volatile and mild; it is the same substance that forms what has been called soda-water, when dissolved in water under pressure.

"Now, so very sparingly soluble in water is chalk by itself, that probably upwards of 5000 gallons would be necessary to dissolve 1 lb. of 16 oz.; but by combining 1 lb. of chalk in water with 7 oz. additional of carbonic acid—that is to say, with as much more carbonic acid as the chalk itself contains—the chalk becomes readily soluble in water, and when so dissolved is called bicarbonate of lime. If the quantity of water containing the 1 lb. of chalk with 7 oz. additional of carbonic acid, were 400 gallons, the solution would be a water of the same hardness as well-water from the chalk-strata, and not sensibly different in other respects.

"Thus it appears that 1 lb. of chalk, scarcely soluble at all in water, may be rendered soluble in it by either of two distinct chemical changes—soluble by being deprived entirely of its carbonic acid, when it forms lime-water, and soluble by combining with a second dose of carbonic acid, making up bicarbonate of lime.

"Now, if a solution of the 9 oz. of burnt lime, forming lime-water, and another solution of the 1 lb. of chalk and the 7 oz. of carbonic acid, forming bicarbonate of lime, be mixed together, they will so act upon each other as to restore the 2 lbs. of chalk, which will, after the mixture, subside, leaving a bright water above. This water will be free from bicarbonate of lime, free from burnt lime, and free from chalk, except a very little, which we keep out of account at present for the sake of simplicity in this explanation. The following table will shew what occurs when this mutual action takes place:

AGENTS.		PRODUCTS.	
Bicarbonate of lime in 400 gallons.	Chalk	16 oz.—16 oz. of chalk	} 2 lbs.
	with Carbonic acid	7 oz. } — 16 oz. of chalk	
Burnt lime in 40 gallons of lime-water		9 oz. }	

A small residuum of the chalk always remains not separated by the process. Of 17½ grains, for instance, contained in a gallon of water, only 16 grains would be deposited and 1½ grains would remain. In other words, water with 17½° of hardness, arising from chalk, can be reduced to 1½°, but not lower.

"These explanations will make it easy to comprehend the successive parts of the softening process.

"Supposing it was a moderate quantity of well-water from the chalk-strata around the metropolis that we had to soften, say 400 gallons. This quantity, as has already been explained, would contain 1 lb. of chalk, and would fill a vessel 4 feet square by 4 feet deep.

"We would take 9 oz. of burnt lime, made from soft upper chalk; we first slack it into a hydrate, by adding a little water. When this is done, we would put the slacked lime into the vessel where we intend to soften; then gradually add some of the water in order to form lime-water. For this purpose, at least 40 gallons are necessary, but we may add water gradually till we have added thrice as much as this; afterwards, we may add the water more freely, taking care to mix intimately the water and the lime-water, or lime. Or we might previously form saturated lime-water, which is very easy to form, and then make use of this lime-water instead of lime, putting in the lime-water first, and adding the water to be softened. The proportion in this case would be one bulk of lime-water to ten bulks of the hard water."

It is of importance that the lime-water—that is, the softening ingredient—be put into the vessel first, and the hard water gradually added, because there is thus an excess of lime present up to the very close of the process. Instead of lime-water, the lime itself may be put at once into the vessel, and some of the water to be soft-

ened gradually added to dissolve it. The softened water thus obtained has no action on lead-pipes or cisterns, as many soft waters have. One ton of burned lime, used for softening, will produce three and a half tons of precipitate. The present water-supply of the metropolis, if subjected to Clark's process, would deposit about fifty tons of chalk daily.

The process was in operation on a large scale for several years (1854—1861) at Plumstead, near Woolwich, where 600,000-gallons daily were operated upon with the most satisfactory result. These works are now given up, though for reasons quite apart from any failure in the process. But several water-works have since been erected, or are in course of erection, by Mr. Homersham, C.E., London, for supplying water from the chalk springs softened by Clark's method; e.g. at Castle Howard, the seat of the Earl of Carlisle (1858); at Caterham, Surrey, for the supply of Caterham, Warrington, and several neighboring towns (1861); at Shooter's Hill, Kent, for the War Office, for softening the water of the Kent Company for the supply of the Herbert Hospital, &c. (1865); at all of which works the process is in successful operation. Mr. Homersham has also completed works near Tring, Herts, for the supply of Tring, Aylesbury, and other towns, with softened spring-water. Mr. Homersham finds that spring-water from the chalk can readily, on the large scale, be softened down from $2\frac{1}{2}$ to $4\frac{1}{2}$ degrees of hardness.

Clark's process is not confined in its effects to softening; it has a decided influence as regards organic impurities; for it not only removes the active source of corruption which exists in all chalk-water, as above explained, but the precipitated chalk carries down with it a large proportion of such organic matters as may be already present. Several calico-printers in Lancashire have had Clark's process in use for several years, for the improvement of the quality of the water employed in their processes.

Natural Process of Purification from Organic Matter.—Although, by means of sand and other filters, or of the liming process, organic contamination of water may be much reduced, there still remains enough to render the water unsafe for use. Is water, then, once corrupted with organic matter, hopelessly and permanently so? This question can be answered in the negative. Filthy water has a tendency to purify itself, and this in two ways. In the first place, in any shallow stream of polluted water, such as the kennels of a street, there may be observed long branches of a sort of slimy vegetation adhering to every projection of the bottom. All this matter has been disengaged from the water, which thus flows away so much the purer. The second and most effective part of the natural purification consists in the actual decomposition of the impurities. The nitrogen of the decaying matter, then, goes to form nitric acid, which, uniting with bases, forms salts of the class called *nitrates*, of which saltpetre is one. Thus, what was in a state of putrefactive change, offensive to the senses, breeding loathsome insects, and causing dangerous disorders, is changed in course of time into a stable and harmless product. This process is constantly going on in rivers and other waters containing organic matter. In the case of streams passing through populous districts, the contamination goes on at a rate far beyond the power of natural purification; but we can easily conceive how a river, very much contaminated with organic impurities at one part of its course, may, after flowing a long way through an uninhabited tract, be almost restored to its natural state. The process is one of oxidation, and takes place at the expense of the free oxygen, of which, in healthy normal water, there ought to be 29 per cent. of the entire volume of gases held in solution.

The oxidation is much favored and hastened when the water percolates or filters very slowly through porous beds of earth. If the filtration has been sufficiently prolonged to convert all the decaying matter into carbonic acid or nitrates, the water will be pure, as far as the organic taint and the presence of animalcules are concerned, and will, in fact, be neither disagreeable nor unwholesome, the amount of the dissolved carbonates or nitrates being unimportant.

Dr Smith has proved by direct experiment that decomposing organic matter passed through a filtering-bed is changed into nitric acid. "A jar, open at both ends, such as is used with an air-pump, was filled with sand, and some putrid yeast, which contained no nitric acid, was mixed with pure water, and poured on the sand, and allowed to filter through. The production of nitric acid was abundant." It is not improbable that other earthy matters, such as loam and clay, may have a

still more decided influence in hastening the formation of the nitrates; and perhaps by imitating more closely the slow mode of filtration by which nature converts surface water into spring water, it may yet be practicable to make the most contaminated waters fit for use.

Conveyance, Storage, and Distribution.

Into the engineering operations connected with the conveyance of water from its source to the town to be supplied, we need not enter, beyond noticing, that when the source is below the level of the houses, steam or other power is necessary to lift or propel the water to the necessary height; while in the more general and more desirable case of the source being higher than the place where the supply is to be delivered, the water is made to flow by its own gravitation, either in a channel or culvert with a continuous descent, as in the ancient *Aqueduct* (q. v.), or in the simpler and more economical modern plan of a line of cast-iron pipes following the inequalities of the surface. The *Croton Aqueduct*, which supplies New York, is carried across the Manhattan Valley, upwards of 160 feet deep, in an inverted siphon, The Glasgow supply from Loch Katrine flows mainly in a sloping channel carried through tunnels and over bridges; but there are four miles of iron pipings across valleys.

The extent of the storage in reservoirs depends on the nature of the supply. If water is derived from perennial springs, whose minimum flow equals the maximum demand, the storage may be the least possible. If a river is the source, the reservoirs should be large enough to hold such a stock as will carry the consumers over the periods when the river is polluted by rains; they should also be large, on the principle of allowing time for purification by subsidence, especially if artificial filtration be not employed. In places where the supply is obtained from surface drainage, or from a small stream, the practice is to build reservoirs capable of containing a five or six months' supply, it being necessary to provide against the greatest droughts that ever happen in any season.

The reservoirs should be deep, so as to prevent vegetation; and the distributing or service reservoirs should be roofed.

In distributing water over a town, two different methods have been adopted, known respectively as the *intermittent* and the *constant* systems of supply. On the intermittent system, water is laid on once a day, or once in two or three days, as the case may be, and fills a tank attached to every separate house, and from this tank the water is drawn off as required. The feeding-pipe of such a tank or cistern is provided with a ball-cock, which ingeniously shuts off or admits the supply, as the cistern may be full or empty. On the constant system, no tank is absolutely needed, but the house pipes are kept constantly charged through their unbroken connection with the distributing reservoir, which must therefore be higher than the highest house to be served. The intermittent supply was until lately employed everywhere in the metropolis; but it is universally admitted that the other system is vastly superior in every respect. The disadvantages of the intermittent practice have been strongly set forth in all the recent official Reports on sanitary improvement: the expense of the erection and repair of cisterns, the trouble requisite to keep them clean, the contamination of the water by the neighborhood of sources of pollution, the frequent waste of water that occurs, the difficulties imposed on the poorer class of tenements where cisterns are not provided—are a few of the objections urged against this mode of supply. In a letter in the *Times*, 3d January 1866, Dr H. Jeaffreson thus describes the condition, in regard to water-supply, of the centres of typhus infection in Lambeth, Southwark, Bethnal-green, &c. "Those houses the best supplied have each a butt, holding about 80 gallons, into which water flows from a stand-pipe for from ten minutes to half an hour each day, and is supposed to supply the wants of 30 persons for cooking, the washing of their persons, house, and linen, and for the rinsing down of the w.c. at such times as it may suit the caprice of any one of the inmates. At other places, a larger butt, but in relation to the number of persons proportionally smaller, supplies a whole court of ten or more three-roomed houses, which have no back-yards, and a population of 150 people—members of 30 different families. On Sundays, even this supply is absent, the water of the day before is gone, and in many houses, that for the Sunday cooking has to be begged from neighbors who may have provided them-

selves with a larger butt, who are more provident or more dirty. More than nine-tenths of these water-butts have no covers; and fully half are so placed as to catch the drippings from the foul eaves of the houses, and are lined internally with scum and slimy vegetation."

One important advantage, arising from the constant system, is the ease with which water can be had in time of fires. The water being supplied at high-pressure, all that is necessary is to affix a hose to the water-plug in the street, when a jet corresponding in height to the pressure is obtained, which can be immediately directed against the fire.

The ratio of the supply to the population varies in different towns. In Edinburgh it is 34 gallons for each individual; in Glasgow, it is 60 gallons. This includes the water furnished to works of various kinds. The eight companies that supply London pour into the city and suburbs not much less than 100,000,000 gallons daily, which gives 206 gallons per house (including manufactories), or 26 gallons to each person. Notwithstanding this, owing to the neglect of the proprietors, "thousands of the poor get but little of it directly any day, and none at all on Sundays."

Cisterns, Pipes.—Owing to the action of water on lead, already described, it is desirable to avoid the use of that metal in connection with very soft lake or river water. With regard to lead pipes, if the precaution is taken when the water has stood for any time in them, of allowing the first portions to run off before any is taken for use, little danger can arise; but either lead cisterns should be wholly avoided, or means taken to ascertain whether they contaminate the water; and if so a remedy should be applied. There are various substitutes for lead as a lining for cisterns. Slate slabs are highly recommended. Gutta-percha is also found to be an easily fitted, cheap, and durable lining. For a few days the water tastes of the naphtha used in applying the lining; but afterwards, no kind of water, not even acids, have any action on the gutta-percha. Pipes of gutta-percha may also be used; they are cheap, and easily fitted up.

Common Wells.—The simplest of all water-supplies is that of a cottage or farmhouse in the country, with a good spring rising to the surface close by; and yet what a poor use is usually made of such a precious boon! The country well is generally a simple cavity to receive the spring, rudely lined, it may be, with stones, but with open mouth, into which dust and dead leaves are blown by every wind, and foul surface-water is trickling from all sides. Being exposed to the light, there is generally a profuse vegetation on the bottom and sides, and, in addition to these impurities, it is further muddled by the dipping in of buckets, often dirty on the outside. Who has not been disgusted, when asking a drink at a cottage, to get water thick with dust and visible impurities, knowing, at the same time, that it might be so easily remedied? A surface-spring should always be covered, and made to issue by a pipe; half a day's labor to create a fall, and a clay drain-tube, will generally convert a filthy puddle into a crystal fount. It is singular to see this blindness to the impurity of water in people otherwise cleanly enough. This is a subject worth the attention of country physicians and clergymen. The evil effects of drinking impure water are not confined to towns. May not the putrid sore throat and malignant fevers that often sweep away whole households in the country, especially in autumn, be partly owing to the cause now pointed at?

Deep wells should invariably be covered, and carefully protected from the infiltration of superficial ooze. The situation of pump-wells is often singularly ill-chosen in this respect. See ARTESIAN WELLS.

WATER-TABLE, a set-off in a wall sloped on top to throw off the rain.

WATERTOWN, capital of Jefferson County, New York, U. S., on the Black River, 96 miles north-west from Utica, and 182 from Albany; has manufactories of cotton, woollen flour, paper, iron castings, machinery, &c. An ice-cave extends partly under the village. Pop. in 1870, 9336; in 1880, 10,697.

WATERTOWN, a city of Wisconsin, U. S., on Rock River, and the Fond du Lac and Rock River Railway, 40 miles east-by-north from Madison. The city is built on both sides of the Great Bend, where rapids with a fall of 24 feet afford water-power for flouring and saw-mills, foundries, and manufactories of agricultural implements, furniture, woollen mills, and potteries. Settled in 1836. Pop. in 1870, 7550; (1880) 7683.

WATERVILLE, a village of Maine, U. S., on the right bank of the Kennebec River, at Ticonic Falls, 83 miles north-north-east from Portland. Around the falls are clustered saw-mills, plough, axe, hoe, and scythe factories, machine-shops, tanneries, &c. W. has a Baptist College, with 120 students, and library of 15,600 volumes, an academy, &c. Pop. in 1870, 4353; in 1880, 4672.

WATER VIOLET. See *HOTTONIA*.

WAT'ERY GRIPES is the popular name for a form of acron diarrhoea occurring in infants, in which there are copious discharges of thin watery motions, often limpid, or almost colorless, and occasionally intermixed with flakes or shreds. This form of diarrhoea may be induced in weakly children by sudden impressions of cold on the surface, so as to check perspiration; or it may be brought on by cold drinks taken when the body is heated. The exhaustion brought about by the copious excretions from the bowels is sometimes so great that the case might be mistaken for one of cholera. On the occurrence of such an attack, the child should at once be wrapped up in warm flannel, placed in bed, with a bag of hot dry bran over the belly; and some arrowroot, with a little brandy, given frequently in teaspoonfuls or larger doses according to age; and the medical attendant should be at once sent for. If medical aid cannot be readily procured, opium must be carefully used to check the profuse evacuations. One of the best preparations is Aromatic Powder of Chalk and Opium, every 40 grains of which contain 1 grain of opium. From 3 to 5 grains of this powder, with a quarter of a grain of ipecacuanha, may be given, and repeated every three or four hours for two or three times, unless any head-symptoms (due to the opium) are perceived.

WAT'FORD, a market-town in the county of Hertford, on the banks of the Colne, 18 miles north-west of London. Straw-plait is manufactured, and silk-spinning and maling are carried on; and there are two large paper-mills. Pop. 7461.

WAT'LING ISLAND, one of the Bahamas (q. v.).

WATLING STREET, one of the great Roman highways of Britain, commencing at Dover, passing through Canterbury and Rochester to London, and thence through Uriconium and Chester to Caer-Sefont, the ancient *Segontium*, in Caernarvonshire. From Uriconium, a branch proceeded north by Manchester, Lancaster, and Kendal, into Scotland. Traces of the ancient road are still to be found in many parts of its course, and in some it is still an important highway. A street in London retains its name. The origin of this name is very uncertain; the most probable supposition is that the original name was *Stratum Vitellianum*.

WATT, James, mechanician, engineer, and man of science, famous as the improver, and almost the inventor of the steam-engine, was born at Greenock in Scotland on the 19th of January 1736. His father was a blockmaker and general merchant at Greenock, was long a member of the council of that burgh, and for a time a magistrate. Two members of James W.'s family—his grandfather and his uncle—had had some local reputation for scientific or engineering ability. The former was a teacher of mathematics, surveying, and navigation at Crawfordisdye, near Greenock; the latter practised as a land-surveyor and engineer with great success at Ayr. The grandfather, Thomas Watt, had been brought early in life to Lanarkshire from the neighborhood of Aberdeen, where his family had previously lived. The father of Thomas Watt, the great-grandfather of James, is said to have farmed a little property of his own in Aberdeenshire, and to have been killed while fighting on the side of the Covenanters against the Marquis of Montrose.

James W. was very weakly as a child, and being unable to go to school with regularity, he became, to a great extent, his own instructor. What schooling he did get, he got in the schools of his native town. He early manifested a turn for mathematics and calculations, and a great interest in machines, and accordingly—his father's business, for which he had been destined, having greatly declined—he was, at the age of 18, sent to London, to learn the trade of a mathematical instrument maker. Ill-health compelled him to return home about a year after; but he had made good use of his opportunities in London; and on his health improving, he resolved to set up as a mathematical instrument maker in Glasgow. The incorporation of hammermen of that city put difficulties in his way; but the authorities of the university took him by the hand, appointed him mathematical instrument maker to the university, and gave him the use of premises within their precincts. He oc-

cupied these premises from 1757 to 1763. They seem to have been badly situated for his business, for which, moreover, at that time there was but little room in Glasgow; and W. during those years was scarcely able to make a living. In 1763, he got a place of business in the town, and after that, he did somewhat better; still, he had to eke out his income by making or mending fiddles (which he was able to do, though he had no ear for music), or doing any mechanical job which came in his way; and no work requiring ingenuity or the application of scientific knowledge seems to have come amiss to him. At length, in 1767, he fell upon a new and a more lucrative occupation. In that year, he was employed to make the surveys and prepare the estimates for a canal projected to unite the Forth and the Clyde. This work could not be carried out at the time, because it failed to obtain the sanction of parliament; but W. had now made a beginning as a civil engineer, and henceforth he got a good deal of employment in this capacity. He made surveys for various canals, for the improvement of the harbors of Ayr, Port-Glasgow, and Greenock, and for the deepening of the Forth, the Clyde, and other rivers. One of the tasks committed to him was to decide whether a projected canal between the Firth of Clyde and the Western Ocean should be made by way of Crinan or of Tarbert; and the last—also the greatest—undertaking of this kind on which he was employed was a survey for a canal between Fort-William and Inverness; a work which has since been executed on a greater scale by Telford. In his surveys, he made use of a new micrometer, and of a machine, also of his own invention, for drawing in perspective—the latter of which appears to have been for several years about this time one of his sources of income. The Reports which he drew up in the capacity of engineer are said to have been remarkable for perspicuity and accuracy.

Living in the college at Glasgow, in constant intercourse with the professors of the university, with access to books, and with much unemployed time on his hands—having, too, a great love of knowledge, and a lively interest in mechanical novelties, W. had been a diligent student of science, and experimenter in the application of science to the arts. As early as 1759, his attention had been directed to the capabilities of steam as a motive-force by Mr. Robison (q. v.), afterwards Professor of Natural Philosophy in the university of Edinburgh, who was then a student in Glasgow. It had occurred to Mr. Robison that steam-pressure might be used to propel wheeled carriages; but it does not appear that either W. or he attempted to carry out this idea. In 1761 or 1763, however, W. made a series of experiments on the force of steam, using a Papin's Digester. These do not seem to have led to any results; and it was not till the winter of 1763—1764, that he began the investigations which ended in his improvement of the steam-engine. During that winter, a working model of the Newcomen engine, kept for the use of the natural philosophy class in the college, was sent to him to be put in repair. W. quickly found out what was wrong with the model, and easily put it into order. But in doing this, he became greatly impressed with the defects of the machine, and with the importance of getting rid of them. The Newcomen engine (see STEAM-ENGINE), was still but little used, and only for pumping water out of mines. It was a cumbersome machine, and it required so much fuel that the expense of working it had restricted, and must always have restricted its use. It was not a steam-engine at all. It was worked by means of the atmospheric pressure; steam being only used in producing, by its condensation, a vacuum in a cylinder, into which—the vacuum made—a piston was depressed by the pressure of the air. The steam issuing from a boiler was admitted into the cylinder until it filled it, when the supply was cut off by a self-acting cock; and then the steam was condensed in the cylinder by means of a jet of water. The water so greatly cooled the cylinder that the greater part of the steam at each stroke of the piston was wasted in heating its walls; and on the other hand, much of the injected water was heated to the boiling-point, and gave off steam, which retarded the descent of the piston. W. found that about four-fifths of the steam, and consequently of the fuel, was wasted; and he saw that to make the machine work economically, two apparently incompatible conditions must be obtained—first, that the walls of the cylinder must constantly be of the same temperature as the steam which came in contact with them; and second, that the injected water must never be heated up to 100°, the boiling-point *in vacuo*. He now experimented upon the conducting power of various substances, and made trial of a cylinder made of wood

steeped in oil; but with this cylinder, though it cooled less rapidly than a metallic one, there was still far too much waste of steam. Constantly, from the end of 1763, occupied with the subject of steam, he at length, early in 1766, hit upon the expedient which solved all his difficulties—the separate condenser, an air-exhausted vessel, into which the steam should be admitted from the cylinder and there condensed. The separate condenser at once prevented the loss of steam in the cylinder which had arisen in the process of condensation; and there was no difficulty in keeping it cool, so as to prevent the undue heating of the injection-water. He had now got a perfectly economical engine on Newcomen's principle, but he did not rest content with this—he resolved to make steam his motive-power. Closing the cylinder at both top and bottom, and connecting the piston with the beam, to which it was to communicate motion, by a piston-rod passing through a stuffing-box, he admitted the steam by suitable valves alternately above and below the piston, to push it downwards and upwards in turn; and this done, his invention was substantially complete. He had at last made a real steam-engine, capable of being worked with a comparatively small expenditure of fuel, and of yielding any desired amount of power. Comparing his invention with the atmospheric engine of Newcomen, it must be admitted that it is not without justice that the popular voice has awarded him the name of inventor of the steam-engine.

W., soon after perfecting his model, formed a partnership with Dr Roebuck, then of the Carron Iron Works, for the construction of engines on a scale adapted to practical uses; and a model was erected at Kinnell, near Borrowstonness, where Dr Roebuck then lived. But Roebuck got into difficulties; and nothing further was done until, in 1773, W. entered into a partnership with Matthew Boulton of Soho, near Birmingham, when, Roebuck's interest having been repurchased, the manufacture of the new engine was commenced at the Soho Iron Works. A patent for his invention had been taken by W. in 1769. He got from parliament a prolongation of his patent for 25 years in 1776.

The advantages of the new engine were in no long time found out by the proprietors of mines; and it soon superseded Newcomen's machine as a pump-engine. W. afterwards made numerous improvements in its construction (for the most important of which see *STEAM-ENGINE*); and in conjunction with his partner Boulton, he immensely improved the quality of the workmanship employed in building engines and other machines. In the years 1781, 1782, 1784, 1785, he obtained patents for a series of inventions—among them, the sun and planet motion, the expansive principle, the double engine, the parallel motion, and the smokeless furnace, of most of which the chief purpose was to make steam-pressure available for turning machinery in mills. The accomplishment of this—extending the application of the new power to the arts—was of scarcely inferior importance to the invention of the steam-engine itself. The first contrivance invented by W. for this purpose, was lost to him through the treachery of a mechanic, who had been employed in making the model, who sold it to a manufacturer named Frickeards, who got a patent for it for himself. The application to the steam-engine of the governor (see *STEAM-ENGINE*) was W.'s crowning improvement. He made numerous inventions unconnected with the steam-engine, several of which he patented, but they are all of minor importance.

He retired from business in the year 1800, giving up to his two sons his interest in the extensive and prosperous business which Boulton had created at Soho. He died at Heathfield in Staffordshire, on the 25th August 1819, in his 84th year. W. was twice married: first in 1768, to his cousin, Miss Miller; and a second time shortly after his removal to Birmingham, to a Miss M'Gregor of Glasgow. He had a most extensive and accurate knowledge of the physical sciences, to several of which he made important contributions—and an almost unsurpassed fund of general information. (His claims to be considered the discoverer of the composition of water are considered in the article *WATER*.) He was elected a Fellow of the Royal Society of Edinburgh in 1784; a Fellow of the Royal Society of London in 1785; a corresponding member of the Batavian Society in 1787; and in 1806, a corresponding member, and afterwards a foreign member, of the Institute of France. The university of Glasgow conferred on him the degree of LL.D. in 1806. His statue, the funds for which had been raised by a public and almost a national subscription, was

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erected in Birmingham in 1834; and his statue is now to be seen in the streets of many of our larger towns. The honors paid to his memory and to himself in his later years appear to have been deserved by his personal qualities, no less than by the immeasurable benefits which his inventive talents have conferred upon the human race.

WATTEAU, Antoine, was born at Valenciennes, in the year 1684. In 1702, he betook himself to Paris, where for some time he worked as assistant to a scene-painter. When this employment failed him, by the retirement of his master from Paris, he employed himself in copying pictures. The talent which he shewed in this humble walk of the art drew the attention of Gillot, a popular painter of the day, who engaged him to assist in his studio. In no long time, it was found that the pupil excelled his master, who speedily relinquished the field in his favor, and became an engraver. The success of W. was now assured; he was made a member of the French Academy, and became by special favor *Peintre de Fêtes Galantes du Roi*. In 1718, he visited England. It is believed chiefly on account of his health, and to consult a certain Dr. Meade, then famous, for whom, during his stay, he painted one or two pictures. He remained about a year, without, as it should seem, much benefit. After his return home, his health gradually declined; and in 1721, he died at Nogent, near Paris.

In virtue of their charming color and graceful design, the pictures of W. continue to please, though his reputation as an artist is now but a faint echo of that which, in his lifetime, he enjoyed. He employed himself chiefly in painting small landscapes, with something of the nature of the *Fête Galante* going on in them—lulls in court-dress, which, as preserving for us the fopperies of the time, are not without a certain value distinct from their purely artistic one.

WATTLE. See **ACACIA**.

WATTLE-BIRD (*Anthochaera carunculata*), an Australian bird, of the family of Honey-eaters (*Meliphagidae*). It is about the size of a magpie, grayish brown above, each feather striped, and bordered with white; the tail brown, long, wide, and graduated. It derives its name from a pendulous reddish wattle on each side of the throat. It feeds chiefly on honey and insects extracted from the flowers of *Banksias*, these trees continuing in flower most of the year. It is a bold and active bird, and drives away all other birds from the part of the tree which it occupies.

WATTS, Isaac, was born on July 17, 1674, at Southampton, where his father had a boarding-school. He was educated at the grammar-school of his native place, and afterwards sent, at the age of 16, to an academy in London, kept by Mr. Thomas Rowe, an Independent minister. Here his devotion to his studies was so excessive as to permanently injure his constitution. In 1696, he became tutor in the family of Sir John Hartopp, at Stoke-Newington, with whom he remained six years. During the latter part of this time, he officiated as assistant to Dr. Chauncey, minister of the Independent Church in Mark Lane, to whose post he succeeded in 1702. His health was throughout infirm; and in 1712, he was prostrated by an illness so violent that he never thoroughly recovered from its effects, though he lived for many years afterwards. A visit which he paid to Sir Thomas Abney, at Theobalds, for change of air, resulted in his domestication in the establishment till his death, 36 years afterwards, on November 25, 1748. As his health permitted, he continued to discharge his clerical duties, and to occupy himself with literary pursuits. His theological works were numerous, but are now quite forgotten. His treatise on "Logic," though long since superseded, had in its day a considerable reputation, and was adopted as a text-book by the university of Oxford. By his well-known Hymns for children, his reputation has been chiefly perpetuated. So lately as 1837, his "Horn Lyricæ" were republished, with a Memoir by Southey. In Johnson's "Lives of the Poets," a notice of him is likewise to be found.

WATTS, Thomas, a distinguished philologist and librarian, was born in London early in the present century. At school he studied Latin and French, and in due time Greek as well; but he principally distinguished himself by his attainments in English. He read every book that came in his way, and he wrote, apparently with the utmost ease, tales, essays, and poetry, very much above the average, not alone of school-boy composition, but of the magazine-writing of the day. To a knowi-

edge of the classics and French, W. soon added an acquaintance with the other languages of the Latin family—as Italian, Spanish, and Portuguese; likewise with the German, Dutch, Swedish, Danish, and Icelandic. The facility with which he acquired these several languages, encouraged him to undertake, from time to time the study of some of the oriental tongues, viz., Hebrew, Arabic, Persian, Turkish, and even Chinese. In each of these he made considerable progress, but cannot be said to have mastered any of them as he did those languages before named, and as he subsequently mastered the Russian, Polish, and Hungarian. There are few Englishmen who know anything of the three languages last named, which W. could read and translate with the utmost ease—being as familiar, in fact, with their great writers as he was with those of Germany or France. It remains only to mention that W. was also well acquainted with the Welsh language and literature, besides having some knowledge of the Gaelic and Irish as well. Upwards of twenty languages have thus been named with which he was well acquainted. No other Englishman has approached him as a linguist, considering the *variety* as well as the *number* of languages which he acquired; while of foreigners, it is not too much to say that Messieurs alone appears to have surpassed him.

In 1832, W. first became a “reader” in the Reading-room of the British Museum, where, in studying some of the languages mentioned, he became acquainted with the deficiencies in the literature of other countries under which our national library then labored. In 1837, the Rev. Mr. Baber, then keeper of the Printed Books, purchased, at his recommendation, a small collection of Russian books, which W. offered to catalogue as a volunteer. This brought him the acquaintance of Mr. Panizzi, who, becoming aware of his attainments, recommended him for employment in the library. Accordingly, he was engaged as an assistant in the department of Printed Books, January 1838. At that time, the books were being transferred from the old rooms in Montague House to the new library. It was W.’s duty to assist in the rearrangement of the books, and when this was finished, he was intrusted with the responsible duty of arranging and placing on their shelves, according to subjects, all the new works purchased or otherwise acquired for the library. For this his vast acquisitions as a linguist eminently qualified him. In other respects also his knowledge of languages was brought to bear in the service of the Museum. He drew up lists of desiderata in all the languages of Europe. It was at his suggestion also that the first large orders were given for American books. “The object” (says W. in a letter to the principal librarian in 1861, printed by order of the House of Commons, in 1866) “which has been kept in view during the last three-and-twenty years has been to bring together from all quarters the useful, the elegant, and the curious literature of every language; to unite with the best English library in England or the world the best Russian library out of Russia, the best German out of Germany, the best Spanish out of Spain, and so for every language from Italian to Icelandic, from Polish to Portuguese. In five of the languages in which it now claims this species of supremacy in Russian, Polish, Hungarian, Danish, and Swedish, I believe I may say that, with the exception of perhaps fifty volumes, every book that has been purchased by the Museum within the last three-and-twenty years has been purchased at my suggestion. I have the pleasure of reflecting that every future student of the less known literatures of Europe will find riches where I found poverty.” The number of books classified and arranged by W., while only an assistant in the library, is reckoned at about 400,000 volumes, and of these as many as 100,000 were arranged upon a plan of his own invention, now known as “the elastic system.” “One of the advantages,” he says, in the letter before mentioned, “obtained by this system is, that when the new library, which surrounds the new Reading-room, was ready for the reception of books, these 100,000 volumes were removed to their new locality without the necessity of altering a single press-mark: had the operation of altering the press-marks been still required, as under the former system, the amount of labor necessary to effect it would have been enormous, and the expense not less than some thousands of pounds.” Here it may be mentioned that it was W. who first suggested the erection of a library and large reading-room in the vacant quadrangle, where now rises the splendid dome erected under the auspices of Panizzi. The suggestion was originally made in a series of articles contributed anonymously to the “*Mechanics Magazine*” for 1836 and 1837, since

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that time acknowledged by W. as his own. In one of these, speaking of the quadrangle, he says: "The space thus unfortunately wasted would have provided accommodation for the whole library. A reading-room of ample dimensions might have stood in the centre, and been surrounded on all four sides by galleries for the books, communicating with each other, and lighted from the top." In 1856, W. was promoted to be assistant-keeper of the Printed Books; and on the opening of the splendid new Reading-room in 1857, he was most fitly appointed its superintendent. In August 1866, W. was appointed keeper of the department of Printed Books. He died 9th September 1868. W. was a member of the Philological Society of London; he was also an honorary member of the Hungarian Academy, to which he was elected at the same time as the late Lord Macaulay. Among the literary productions of W. may be mentioned: "Notes of a Reader," contributed to a weekly periodical entitled "The Spirit of Literature," 1830; numerous poetical pieces contributed to Linnington's "Rhetorical Speaker and Poetical Class-Book," 1836; "A Letter to Antonio Panizzi, Esq., on the reputed Earliest Printed Newspaper, The English Mercury, 1668," 1839; "A Sketch of the History of the Welsh Language and Literature" (reprinted from Knight's "English Cyclopædia"), 1839; more than a hundred biographies of eminent men, Russian, Hungarian, Bohemian, &c., contributed to the same "Cyclopædia"; numerous articles in the "Biographical Dictionary" of the Society for the Diffusion of Useful Knowledge; papers in the "Transactions of the Philological Society," among which are an "Essay on the Hungarian Language," and a biographical notice of Cardinal Meszofanti; also contributions to the "Quarterly Review," the "Athenæum," and other literary periodicals.

WAUKEGAN, a city and port of Illinois, on the west shore of Lake Michigan, 35 miles north-by-west from Chicago, and 50 miles south of Milwaukee, connected with both by railway. The town is handsomely built on a bluff, 50 feet above the lake, and has 6 churches, 3 academies, steam flour-mills, and considerable commerce. Pop. (1870) 4507; (1890) 4,012.

WAVE, the name given to a *state of disturbance* propagated from one set of particles of a medium to the adjoining set, and so on; sometimes with, sometimes without, a small permanent displacement of those particles. But the essential characteristic is, that energy (see *FORCE*), not Matter (q. v.), is on the whole transferred. The theory of wave-motion is of the utmost importance in physical science; since, besides the tide-wave, waves in the sea, in ponds, or in canals, undulations in a stretched cord (such as a pianoforte wire), or in a solid (as sound-waves or earthquake-waves), we know that sounds in air are propagated as waves (see *SOUND*), and that even light (see *UNDULATORY THEORY*) is a form of wave-motion.

The general investigation of the form and rate of propagation of waves demands the application of the highest resources of mathematics; and the theory of even such comparatively simple cases as the wind-waves in deep water (the Atlantic roll, for instance), though easily enough treated to a first, and even to a second and third approximation, has not yet been thoroughly worked out, as fluid friction has not been taken account of. In this article, therefore, we will merely state some of the more important conclusions which mathematical analysis has established in the more difficult of these inquiries, comparing them with the observations of Scott Russell and others; while we give at full length the very simple investigations of the motion of a wave along a stretched cord, and of the propagation of a particular kind of sound-wave.

To find the rate at which an undulation runs along a stretched cord, as, for instance, when a harp-string is sharply struck or plucked near one end, a very simple investigation suffices. Suppose a uniform cord to be stretched with a given tension in a smooth tube of any form whatever, we may easily shew that there is a certain velocity with which the cord must be drawn through the tube in order to *keep it pressed on it at any point*, that is, to move independently of the tube altogether. For the pressure on the tube is due to the tension of the cord; and is relieved by the so-called Centrifugal Force (see *CENTRAL FORCES*) when the cord is in motion.

If T be the tension of the cord, r the radius of curvature of the tube at any point, the pressure on the tube per unit of length is

$$\frac{T}{r}.$$

If m be the mass of unit length of the cord, v its velocity, the centrifugal force is

$$\frac{mv^2}{r}$$

These are equal in magnitude, and so destroy each other, if

$$T = mv^2.$$

Hence, if the cord be pulled through the tube with the velocity thus determined, there will be no pressure on the tube, and it may therefore be dispensed with. If we suppose the tube to have a form in which the extreme portions are in one straight line, the cord will appear to be drawn with velocity v , along this, the curved part being occupied by each portion of the cord in succession: presenting something like the appearance of a row of sheep, in Indian file, jumping over a hedge.

To a spectator moving with velocity v , the straight parts of the cord will appear to be at rest, while an undulation of any definite form and size whatever runs along it with velocity v , in the opposite direction. This is a very singular case, and illustrates in a very clear manner the possibility of the propagation of a solitary wave.

Thus we have proved that the velocity with which an undulation runs along such a cord is

$$\sqrt{\frac{T}{m}}$$

If l be the length of the cord in feet, w its whole weight, W the appended weight by which it is stretched, $g = 32.2$ feet, the measure of the earth's gravity, this becomes

$$\sqrt{\frac{W}{wg}}$$

This formula is found to agree almost exactly with the results of experiment. We can easily see why it should be to some small extent incorrect, because we have supposed the cord to be inextensible, and perfectly flexible, which it cannot be; and we have neglected the effects of extraneous forces, such as gravity, the resistance of the air, &c.

Let us next consider the motion of air in a cylindrical tube, in the particular case in which the leg of a vibrating tuning-fork is applied at one end. This is a simple case of the propagation of sound waves. We shall treat it by a synthetical process, somewhat like that given by Newton.

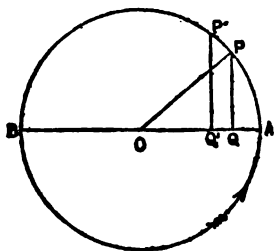
As we have already seen (see PENDULUM), a simple vibration such as that of a pendulum or tuning fork is the resolved part, in a definite line, of the uniform motion of a point in the circumference of a circle. What we have now to shew is, that such a motion of all the particles of air in the pipe, the phase of the vibration (or the position of the particle in its path at any instant) depending on its distance from the end of the tube, is consistent with mechanical principles. When this is done, it will be easy for us to trace, in this particular example, the process by which the wave is propagated from one layer of the fluid to the next. We must now consider (a little more closely than in PENDULUM or SOUND) the nature of the simple vibration of each particle of the air.

Suppose P to move, with uniform velocity V , in the circle APB , and let PQ be drawn perpendicular to the fixed diameter, OA . Then the acceleration of P 's motion is $\frac{V^2}{OA}$ in the direction PO . Hence in the motion of Q , which is a simple vibration, we have, by the rule for resolving velocities and accelerations (see VELOCITY),

$$\text{Velocity of } Q = \frac{PQ}{OA} V \text{ in the direction } QO;$$

$$\text{Acceleration of } Q = \frac{OQ}{OA} \frac{V^2}{OA} \text{ in the direction } QO.$$

Next consider two particles of air near one another in the axis of the tube, the masses of air in two contiguous cross-sections of the tube. If the phase of vibration were the same for both, they would be



equally displaced from their original positions, and the air between them would be neither compressed nor dilated. Hence, that a wave may pass, the phases must be different. Let, then, Q represent the position of the one particle, or layer, in its line of vibration at any instant; Q', the simultaneous position of the other. The first will be displaced through a space OQ from its position of rest; the second, through a space OQ'; and their distance will therefore be altered by the amount QQ', which may be taken to represent the compression or dilatation. But it is easy to see that, as P and P' move round, QQ' is always proportional to PQ. Hence the compression or dilatation of the air in any cross-section of the tube is proportional to the

velocity with which it is moving. Hence the difference of pressure before and behind any such section is proportional to the difference of velocities—i. e. to the acceleration of the motion while the section passes over a space equal to its own thickness. And this is consistent with mechanical principles, for the mass of air in the section is constant, while the difference of pressures before and behind produces the acceleration, and should therefore be proportional to it. The particles of air in cross-sections of the tube therefore vibrate, each in the same period as does the tuning-fork, but the phase is *later* for each section in proportion to its distance from the fork. Where the phase is one or more whole vibrations later than that of the fork, the motion is exactly the same as that of the fork, and *simultaneous* with it. At all other points, it is the same as that of the fork, but not simultaneous. Thus, the greatest displacement of the fork is immediately shared by the layer next it, later by the next layer, and so on. Thus, a wave of displacement travels along the tube from one section to the next, while each particle merely oscillates backward and forward through (in general) a very small space about its position of rest.

The reader who has followed the little geometrical investigation above will have no difficulty in proving for himself that the velocity with which the wave travels is proportional to

$$\sqrt{\frac{p}{\rho}}$$

where p is the pressure, and ρ the density of the air. The easiest mode of doing this is to express, in terms of these and other quantities, the equation given us by the laws of motion.

Mass \times Acceleration = Difference of pressures,

and to assume that Hooke's (q. v.) Law holds, even during the *sudden* compression of air. This, we know, is not the case; so that a correction has to be applied to the above expression, depending on the heat developed by sudden compression, or lost in sudden rarefaction, by each of which the elastic force of the air is *increased*. But this has been already discussed in SOUND.

The above formula shows us, however, that the velocity of sound is not affected by the pressure of the air—i. e., the height of the barometer—since, in still air, p is proportional to ρ . The velocity does depend on the temperature, being, in fact, proportional (*ceteris paribus*) to the square root of the temperature measured from absolute zero. See HEAT.

We see also from the formula that the velocity is inversely as the square root of the density of the gas—the pressure being the same. Thus, a sound-wave travels about four times faster in hydrogen than in air.

Also, we see that, within the limits of approximation we have used, the velocity does not depend upon the intensity, pitch, or quality of the Sound (q. v.). The investigations which seem to lead to slight modifications of this conclusion are too recondite to be introduced here. We can only mention, also, the beautiful investigations of Stokes (q. v.) connected with the extinction of a sound-wave as it proceeds, partly by fluid friction, partly by radiation. And we may conclude by stating, that the result of a completely general investigation of the velocity of a sound wave gives, to a first approximation, the result we have deduced from the study of a simple particular case.

We now come to the consideration of waves in water. Of these, there are several species. One, however, we may merely mention, as its theory is the same as that just briefly discussed. This is a sound-wave, or *wave of compression*, in water. Its velocity is considerably greater than that of sound in air (see SOUND). The others, which are commonly observed on the surface of water, depend on mere changes of level, and their effects; and in studying them, we may consider water as incompressible.

The first of these is what is called a *long* or *solitary* wave. Its essential characteristic is, that its length is great compared with the depth of the liquid in which it moves. To this class belong the tide-wave (see TIDES), and the long wave which accompanies a canal-boat, and which we see slowly traversing the canal, when the boat is stopped. Scott Russell has made many interesting observations on this wave, all of which accord well with the results of the mathematical theory of its propagation. The velocity of this wave depends solely on the depth, not on the density of the liquid in which it moves—and in a uniform canal the velocity is that which would be acquired by a stone falling freely through a space equal to half the depth of the water. Another characteristic of this wave is that, after it has passed, it leaves the water bodily transferred through a small space along the bed of the canal—forwards or backwards, according as it consists of an elevation or a depression of the water-surface. Scott Russell has shown that the most favorable rate at which a canal-boat can be drawn is when its velocity is such that it rides on the crest of the solitary wave. If drawn at any other speed, it leaves the solitary wave behind, or is left by it; and in either case, part of the horse's work is expended in producing fresh solitary waves. An excellent mode of observing these waves is to tilt slightly a rectangular box containing some water, and restore it to its original position. A long wave is thus formed, which is reflected repeatedly at the ends of the box, and whose rate of motion may be accurately observed by watching the image of a candle reflected at the surface of the water. If the sides of the box be made of glass, and some light particles be dispersed through the water, their motions enable us to discover all the circumstances of the propagation of this wave.

We next come to what are called *oscillatory* waves in water or other liquids. To this class belong all waves whose length from crest to crest is small compared with the depth of the liquid; from ripples on a pool to the long roll of the Atlantic. They are never observed as solitary waves, their general characteristic being their periodical recurrence. And, by watching a piece of cork floating on the surface, we see that it moves forwards when at the crest of the wave, and backwards through an equal amount when in the trough. Also it rises while passing from trough to crest, and sinks from crest to trough. Mathematical investigation, confirmed by experiments with floats at sea, and with short waves in the glazed box before described, shows that each particle of the water describes a *circle* about its position of rest in the vertical plane in which the wave is advancing. Particles at greater and greater depths describe smaller and smaller circles. The diameters of these circles diminish with extreme rapidity. At a depth equal to the distance from crest to crest (i. e., the length of the wave), the displacement of the water is already only 1-588th of that at the surface. At the depth of two wave-lengths, it is about 1-390,000th of that at the surface. Thus we may see to how small a depth the ocean is agitated even by the most tremendous wind-waves; for, according to Scoresby, 48 feet is about the utmost difference of level between crest and trough in ocean-waves. If the wave-length be 300 feet (which is a large estimate), then at a depth of 300 feet the water-particles describe circles whose radii are only the 31-6-588th of a foot, or about four-tenths of an inch; and at 600 feet this is reduced to 1-1900th of an inch;

while the depth of the Atlantic is in many parts more than three or four miles. In this case, the velocity of propagation of the wave has been shewn to be

$$\sqrt{\frac{gl}{2\pi}}$$

where g is, as before, 32.2 feet; l is the wave-length in feet; and is the ratio of the circumference of a circle to its diameter (see QUADRATURE OF THE CIRCLE). Thus, the velocity of an oscillatory wave in deep water is proportional to the square root of its length. This fact has been of use as an analogy in helping us to account for the Dispersion (see REFRACTION) of Light, where, by experiment, we know that the waves of red light are longer than those of blue light, and also that they travel faster in refracting media.

When the depth is not infinitely great compared with the length of a wave, theory and experiment agree in shewing that the motion of each particle takes place in an ellipse whose major axis is horizontal. These ellipses diminish rapidly in length as we descend in the liquid, but still more rapidly in breadth; so that, as was to be expected, the particles at the bottom oscillate in horizontal straight lines. The expression for the velocity of propagation is now by no means so simple as in the previous cases—but is easily shewn to include the values already given.

So far, the first approximation. A section of the surface made by a vertical plane in the direction of the wave's motion, is shewn to be bounded by the *Harmonic Curve*, or *Curve of Sines*, the form assumed by a vibrating string (see SOUND); from which it follows that the crests are similar to the troughs. The second approximation makes the troughs flatter, and the crests steeper, and also shows that the particles are, on the whole, carried *forward* by each successive wave. The amount of this progression diminishes rapidly with the depth below the surface. A third approximation shews that the velocity is, *ceteris paribus*, greater the greater is the height of the waves.

When waves advance towards the shore, their circumstances change, in general gradually, from those of oscillatory waves to those of waves of translation, as the depth of the water becomes less and less considerable in comparison with the length of the wave; and it is found by experiment that they "break," as it is called, when the depth of the water is about equal to the height of the crest above the undisturbed level. All the curious phenomena of breakers are thus easily explained by the results we have already given, when they are considered with reference to the gradual alteration of the depth of the water.

Finally, we must notice a singular phenomenon often observed, viz., that of a series of waves breaking on the coast, every eighth, or ninth, or tenth, &c. is seen to be higher than its predecessors or successors. The explanation is simple enough, and points to the simultaneous existence of two or more sets of oscillatory waves of different lengths, due in general to quite distinct causes, which reach the shore together.—For further information on this subject the reader is referred to papers by Stokes in the "Cambridge and Dublin Math. Journal," vol. iv., and the "Cambridge Phil. Transactions," vol. viii., and to Airy's "Tides and Waves" in the "Encyclopædia Metrop."

This might lead us to consider the very interesting case of "*Co-existence of Small Motions*" presented by the Interference (q. v.) of such waves; but we have already in various articles (see POLARISATION, SOUND, UNDULATORY THEORY) given sufficient examples to illustrate the great principle.

There remains the consideration of the propagation of waves in elastic solids, among which, at least so far as luminiferous vibrations are concerned, it appears that the Ether (q. v.) must be ranked. This is a subject of a higher order of difficulty than any of those before mentioned, and, in the case of light at least, has not yet been treated in a thoroughly satisfactory manner, though such men as Cauchy, Neumann, Macculagh, Green, and Stokes have written profound memoirs upon it.

WAVRE, a town in the province of South Brabant, Belgium, 15 miles south-east of Brussels, has a pop. of 5900, who are mostly engaged in the manufacture of hats, leather, and cotton-yarn. W. is better known as the scene of a desperate and protracted conflict between the French and Prussians, on the 18—19th June 1815.

The former, under Grouchy, Gerard, and Vandamme, advanced against the Prussians at the same time as Napoleon directed the troops under his immediate orders against Wellington at Waterloo (q. v.), and being much superior in number (32,000 to 15,900), drove the Prussians, under Thielman, into W., where they defended themselves with desperate firmness, repulsing thirteen different assaults in the course of the 18th. On the following morning, Thielman, who had heard of the victory at Waterloo, attacked Grouchy, but was repulsed with vigor, though the urgent orders of Napoleon forced the latter to retreat to Laon, instead of following up his success.

WAX. Under this term, chemists include various matters of a well-known (so-called *waxy*) appearance, derived both from the animal and the vegetable kingdoms. While in their general relations they approximate to the Fats, they differ materially from the latter in their chemical composition; those of them which have been carefully examined, being found to consist partly of mixtures of alcohols and compound ethers, and partly of free fatty acids. Their general properties may be thus laid down: They are solid or semi-solid matters; are easily broken when cold, but at a moderate warmth are soft and pliable, and fuse at a temperature below 212° . They have a peculiar glistening appearance, are lighter than water, are insoluble in that fluid and in cold alcohol, but dissolve readily in ether; they are combustible, and burn with an illuminating flame, are non-volatile, and when heated in a free atmosphere, undergo decomposition. In this category are included spermaceti (which has been already considered), bees' wax, Chinese wax, and other less known kinds, as palm or vegetable wax (obtained from the bark of *Ceroxylon andicola*, by the action of hot water and pressure), Carnahuba wax (an exudation from the leaves of a Brazilian palm), sugar-cane wax, &c.

Bees' wax is an animal secretion formed by the bees from sugar, and constitutes the material of which the cells of the honey-comb are composed. It is obtained by expressing the honey, and fusing the residue in boiling-water. In this state it is of a yellow color (*Cera flava*). It may be bleached, so as to form white wax (*Cera alba*), by being exposed in thin slices to the action of solar light, or by the action of nitric acid. (Chlorine readily destroys the color, but renders the wax unfit for candle-making, as a portion of the hydrogen of the wax is replaced by chlorine, and the caudles, when burning, evolve irritating vapours of hydrochloric acid gas.) From the researches of Sir B. Brodie ("Phil. Trans." 1848, 1849), it appears that wax consists of three different substances, *myricin*, *cerin*, and *cerolein*, which are separable from one another by means of alcohol. *Myricin*, which is insoluble in boiling alcohol, constitutes more than two-thirds of the bulk of ordinary wax. *Cerin*, or *cerotic acid*, which dissolves in boiling alcohol, but separates on cooling, varies in quantity in different specimens. In one sample of genuine bees' wax, Brodie found that it constituted 22 per cent., and it was always present in European samples, while in Ceylon wax it was entirely absent. This curious variation in the nature of an animal secretion, under different conditions of life, resembles the variations sometimes noticed in the acids of butter, in which the butyric and caproic acids of one season are replaced in another by vaccinic acid, differing from the former acids in the amount of oxygen alone. *Cerolein*, the substance soluble in cold alcohol, is a greasy body, constituting 4 or 5 per cent. of ordinary wax. Without entering into chemical details, we may observe that bees' wax yields the following derivatives: Cerotic acid or cerin, $\text{HO}, \text{C}_{44}\text{H}_{88}\text{O}_2$; cerylic alcohol or cerolin, $\text{HO}, \text{C}_{44}\text{H}_{88}\text{O}$; melissylic alcohol or melissin, $\text{HO}, \text{C}_{32}\text{H}_{64}\text{O}$; melissic acid, $\text{HO}, \text{C}_{32}\text{H}_{64}\text{O}_2$; palmitic acid, $\text{HO}, \text{C}_{32}\text{H}_{64}\text{O}_2$; myricin, $\text{C}_{32}\text{H}_{64}\text{O}_2$; and melene, $\text{C}_{32}\text{H}_{64}$.

Chinese Wax ($\text{C}_{108}\text{H}_{216}\text{O}_4$) is supposed to be the produce of a species of insect of the Coccus family, and consists principally of cerotic acid, in combination with oxide of cerotyl.

Both yellow and white bees' wax occur in the Pharmacopœia. The characters and tests, as given in that work, are—*Of yellow wax*: "Firm, breaking with a granular fracture, yellow, having an agreeable honey-like odor; not unctuous to the touch, does not melt under 140° , yields nothing to cold rectified spirit, but is entirely soluble in oil of turpentine; boiling-water in which it has been agitated, when cooled is not rendered blue by iodine." *Of white wax*: "Hard, nearly white, translucent; not unctuous to the touch, does not melt under 150° ." The iodine test is used because wax is often adulterated with starch. Wax was formerly much

employed internally as an emollient medicine, in cases of suspected ulceration of the intestines. At present, it is only used as an external agent, being an ingredient of many ointments and plasters.

The commercial value of bees' wax is very great; and if it were possible to ascertain the total of the quantity produced, it would cause great surprise at the amount of valuable material derived from a source apparently so insufficient. Its chief uses are for candles, modelling, medicinal cerates or ointments, besides many minor purposes. Nearly 500 tons are annually imported into Great Britain, the value of which is about £30,000; but so large is the quantity consumed in the ceremonies of the Greek and Roman churches, that Russia alone consumes more than four times that amount, and the various Catholic countries probably ten times as much. The INSECT WAX of China, or Pe-la, has lately been imported in small quantities, and used in the manufacture of candles by Messrs Price & Co.; but it is far too costly for general use (see WAX INSECT). In China, this wax is very highly valued, and is so costly as to be used only by the highest classes; it is white, and breaks with a crystalline fracture and pearly lustre. Of Vegetable Wax, there are four distinct kinds known in commerce. The first in importance is the JAPAN WAX, which is almost as white and compact as refined bees' wax, which it closely resembles; it was first brought to Great Britain in 1869, and since then, some very considerable importations have taken place. It is said to be obtained by boiling the seeds of a species of RHUS (*R. succedanea*). It has only been used in making candles. BRAZILIAN VEGETABLE WAX is also an article of regular importation, but only in small quantities; it is obtained from the leaves of *Corypha cerifera*, the Carnahuba Palm of the Brazilians. It forms a glossy varnish-like covering; and when the leaves are gathered, and begin to shrink from withering, it cracks and peels off, and is collected and melted into masses. It is hard and brittle, and of a dull yellow color. The candle makers have used it for mixing and improving other materials. In Brazil, candles are wholly made of it, or half the quantity of stearine is added. The VEGETABLE WAX of the Andes is also yielded by a palm (see WAX PALM). Although much used in Mexico, it has not yet become of commercial importance to Europe. It is chiefly used for candles in the churches. MYSTLE WAX, though rarely seen in Europe, is much used in the British colonies of North America, and the United States, and at the Cape of Good Hope; it is also in use in Brazil. It is procured by boiling the berries of *Myrica cerifera* in North America, and probably from other species in Brazil, and at the Cape of Good Hope. It resembles bees' wax very much, except that it has a greenish-yellow instead of a yellow color. It is only used for candle-making. See CANDLEBERRY.

Of the manufactured compounds called wax, the following are the chief—viz., SEALING-WAX (q. v.). MODELLERS' WAX, used by artists for modelling small works. It consists of equal parts of bees' wax, druggists' lead-plaster—olive oil and yellow resin, and just sufficient whiting added to produce the consistency of putty. GILDERS' WAX consists of four parts of bees' wax, well mixed by melting with one part each of verdigris and sulphate of copper.

The bees' wax of commerce is of a dirty yellow color, and mixed with many impurities. It has, consequently, to undergo a process of bleaching, by which it is rendered quite white and pure. The usual process is to melt the wax with boiling-water, and stir them together for a short time, so as to separate the impurities from the wax. It is then allowed to rest for a short time, and the pure wax floats on the top; and when cold, is taken off in a cake, the lower part of which is often discolored with the dirty water. This is scraped off, and mixed with the next lot to be operated upon. The purified portion is next remelted, and is then allowed to trickle from the melting-pan on to a wooden cylinder, revolving rapidly, and partly immersed in pure cold water, in a large cistern. This throws it into the water in the form of fine thin feather-like flakes, which cool and harden instantly in the water. When all is run off, the wax is removed from the water, and laid on linen cloths, placed on tables in a field for the air to bleach. From time to time, the flakes are turned over and examined; and when the bleaching effect of the air seems to have stopped, the wax is remelted, and converted into flakes in the cistern, and replaced in the bleaching-ground until it is quite white.

WAX, MINERAL, is a natural product known under the name of Ozokerit. It used only to be found in small quantities oozing from rocks of coal formation, though

near Edinburgh, candles, as curiosities, were made of it by the miners. Lately, however, immense deposits of the hydrocarbon have been found in several parts of Europe, chiefly in Galicia and Moldavia, and it has now become a commercial article for the manufacture of candles. When found, it has a dark, rich-brown color, slightly greenish and translucent in thin films; but when refined, it resembles well-bleached bees' wax. Its melting-point is about 60°.

WAX-CLOTH, a name sometimes given, but very erroneously, to **FLOOR-CLOTH** (q. v.).

WAX-FLOWERS. An elegant use is found for bees' wax in the manufacture of wax-flowers. The wax for this purpose is bleached and prepared in thin sheets of various colors, which are cut out into the shapes for petals and leaves, according to the kind of flower to be imitated. They are easily made to adhere, either by a slight amount of heat, or a little melted wax.

WAX INSECT (*Coccus stenota*; see *Coccus*), a very small white insect, a native of China, of the same genus with the Coccineal and Kermes insects, and with the Scale insects, which are the pest of our greenhouses, valuable on account of the wax which it produces. It is found about the beginning of June on the branches of certain trees, on the juices of which it feeds, particularly on those of a kind of Sumach (*Rhus succedaneum*). The wax is deposited on the branches as a coating which resembles hoar-frost. This is scraped off towards the end of August, melted in boiling-water, and strained through a cloth. See **WAX**. The Chinese W. I. has been introduced by the French into Algeria.—Another W. I. is found in South America, but is not yet well known, nor has its wax become an article of commerce.

WAX MYRTLE. See **CANDLEBERRY**.

WAX-PAINTING is an art of great importance, better known, however, under the name of **Encaustic Painting** (q. v.).

WAX PALM (*Ceroxylon*—or *Iriartea*—*andicola*), a lofty palm, found in the Andes, on the eastern borders of Peru, at an elevation of 3000 feet and upwards above the level of the sea. It grows to the height of 160 feet, and on the petioles of the fallen leaves, a resinous secretion is produced in great abundance, composed of about two parts of yellow resin, and one of a kind of wax, more brittle than bees' wax. This wax exudes also from the leaves, and is whitish, almost inodorous, except when heated, when it gives out a resinous odor. It is used by the inhabitants of the country in which it is produced for making candles, but is usually mixed with wax or tallow. It is probable that the W. P. would succeed well in the south of Europe, as its native climate is not dissimilar. The usual method of obtaining the wax is by felling the tree. Each tree yields about 25 lbs. The wax is scraped off, melted, and run into calabashes. The timber of this palm is very hard and durable; the leaves are used for thatching, and the fibres for cordage. The tree is a beautiful one, with a stately stem, and a head of large pinnate leaves.—In some of the northern provinces of Brazil, wax is obtained from the *Carnaubá Palm* (q. v.).

WAX-SCULPTURE. The use of wax for sculpture is believed to be of very ancient origin; and not only have the tombs of Southern Italy yielded many specimens of the portraits of the deceased modelled in wax, but many fine bronzes in antiquarian collections bear evident marks of having been modelled in wax by the process called *cire-perdue*. This consists in producing a model in wax, and then coating it with clay or other material in a soft state; this is allowed to harden; and the wax is then melted out by heat, and the molten metal poured in. A very fine cast of the wax-figure is thus obtained; but, of course, the wax-model of the artist is lost, after the first copy is taken; hence, such specimens are very highly prized by connoisseurs. During the 14th and 15th centuries, the art of modelling in wax, or *cero-plastica*, was much practised, especially in Italy and in Germany, by many of the first artists, even Michael Angelo not excepted; and many of their original works in wax are still preserved. They were chiefly, however, in low relief, although very fine statuettes were also produced by men of great eminence.

WAX-TREE (*Vismia*), a genus of plants of the natural order *Hypericaceae*,

having a 5-parted calyx, and 5 petals, generally covered with soft hairs on the inside. All the species yield a yellow viscid juice when wounded, which, when dried, becomes somewhat similar to gumbooge. The species are natives of the tropical parts of America.

WAXWING (*Bombycilla*), a genus of birds of the family *Ampelidae*, or Chat-terers (q. v.), having a short, straight, elevated bill, with a very wide gape, as in the Fly-catchers, but without bristles; both mandibles notched at the tip; the wings rather long, broad, and pointed; the legs short; the toes long, with sharp and curved claws. The name W. is derived from a very peculiar character, which the wings exhibit; some of the secondaries and tertiaries terminating in horny expansions of the shaft, resembling small pieces of red sealing-wax. The species are few, but widely diffused over the colder parts of the northern hemisphere. The only European species is the **EUROPEAN W.**, or **BOHEMIAN CHATTERER** (*B. garrula*), which is found in summer in the arctic regions of Europe, Asia and America, migrating southwards in winter, sometimes as far as the shores of the Mediterranean; most abundant in America, during winter, about the great lakes and the northern part of the Valley of the Mississippi. It is found also in Japan. It is only an occasional winter-visitant of Britain. In some winters, numerous flocks are seen; in other winters, and more generally, none at all. It is in severe winters that this bird is most frequently seen in Britain, and in the more southern parts of Europe. It is gregarious in winter, and the flocks are often large. It feeds on insects and worms, seeds, berries, and other fruits. It is a handsome bird, nearly as large as the Song Thrush; reddish gray, with a black patch on the throat, and a black band on the forehead; the tail-coverts brownish orange; the primaries, secondaries, and tail-feathers tipped with yellow, two white bands on the wings; the lower parts silvery gray. The head is surmounted by an erectile crest of brownish orange feathers. The song of the W. is a weak whistling, bearing a little resemblance to that of the thrush. It is easily tamed. The flesh is said to be delicate food.—The **AMERICAN W.**, or **CEDAR BIRD** (*B. cedrorum*, or *carolinensis*), is a very similar but smaller species, found only in North America, from Canada to Central America, less migratory, and never visiting arctic regions. The general color is reddish olive, passing into purplish cinnamon in front, and into ash-color behind; the chin black; no white on the wings; the lower parts yellow. It is crested like the European Waxwing. Great flocks of cedar birds collect in the end of summer. They feed on berries, and are particularly fond of those of the Red Cedar. The Cedar Bird is extremely voracious, and when food abounds, sometimes gorges itself so much, that it may be taken by the hand. It is in much esteem for the table.—Another species is found in Japan, having no waxy drops on the wings.

WAXY DEGENERATION is a morbid process in which the healthy tissue of various organs is transformed into a peculiar substance, allied in some respects to amyloid compounds, and in others to albuminous substances. Organs affected by this degeneration have a certain resemblance in consistency and physical character to wax. They may be cut into portions of the most regular shape, with sharp angles and smooth surfaces; and the thinnest possible slices may be removed by a sharp knife for microscopical examination. Such organs are abnormally translucent, increased in volume, solidity, and weight. Usually, the first parts affected by this degeneration are the small blood-vessels, the middle or muscular coat being first changed. Subsequently, the secreting cells become similarly affected. When a solution of iodine is brought in contact with such tissues, a very deep violet red color is produced; and this deep red color is alone a sufficiently characteristic test. Although amyloid degeneration is common to many tissues and organs, the parts most frequently affected are the spleen, liver and kidneys. This morbid condition in one or more organs is the expression of a general pathological state, the conditions and relations of which are as yet but little known.

WAYLAND, the Smith (Ang.-Sax. VELAND; old Norse, VÖLUNDE; Ger. WIELAND), was, according to the old German Saga (the principal traits of which are already contained in the older Edda, but which is related in the most detailed form in the Völundasaga), a son of the sea-giant Wate, a nephew of King Völund, and of the sea-nymph Wac-hilt. His father had bound him, at first, apprentice to the celebrated smith Mim, then took him across the sea to the most skilful dwarfs, from

whom he not only soon learned all their science but far surpassed them.* He afterwards dwelt a long time in Ulfdaler (the Wolf's Valley, which, by comparison with other sagas, appears to correspond to the Greek Labyrinth) along with his two brothers—Egil, the best archer, to whom the oldest form of the Tell legend attaches; and Slagfadr, whom the saga has not further characterised. The brothers here met three swan-nymphs, and lived with them for seven years, when they flew away to follow battles as Walkyries (q. v.). Afterwards, W. came to King Nidung, who made him lame, by cutting the sinews of his feet, and put him in prison, for which W. revenged himself by putting the king's two sons to death, and violating his daughter Beadohild, who afterwards gave birth to Wittich, a powerful champion of the German hero-legends. W. then flew away in a feather-robe, which he himself manufactured, and which his brother Egil had tried first, but was precipitated to the ground. Skillfully putting together and supplementing the various old legends, Simrock has produced the Saga of W., as a whole, in his poem "Wieland der Schmied" (Bonn, 1836), and in the 4th part of his "Heldenbuch" (Stuttg. 1843). The legend was a favorite one among all the Germanic nations, as is shown by the frequent allusions to it in Scandinavian, Anglo-Saxon, English, and German poems, as well as by the numerous fragments yet extant in oral tradition throughout all Teutonic countries. The German poems to which the *Vilfinasaga* appeals, which were in existence up to the 18th c., have been utterly lost. Even beyond the bounds of Germany, old French poems and traditions tell of Gallans the smith. See Deppeing and Michel, "*Veland le Forgeron*" (Par. 1838). The legend of W. is in fact one of those myths common to the Indo-Germanic family. Besides the German tradition, it is found most distinctly among the Greeks, in the different stories of Daedalus, Hephaestus, Erichthonius, and so forth. Next to Jacob Grimm's profound discussion in the "*German Mythology*," Kuhn has pointed out in the best manner the significance and ramifications of the myth in his treatise, "*Die Sprachvergleichung und die Urgeschichte der Germ. Völker*," in the "*Zeitschrift für vergleichende Sprachforschung*" (vol. iv. Berl. 1864).

WAYNE, Anthony, an American general of the war of the Revolution, was born at Waynesborough, Pennsylvania, January 1, 1745. His grandfather, a native of Yorkshire, commanded a squadron of dragoons at the battle of the Boyne, and emigrated to Pennsylvania. Anthony was educated at Philadelphia; at the age of 18, he was employed as a land-surveyor, and was selected by Benjamin Franklin to form a projected settlement in Nova Scotia. At the beginning of the American revolution (1775), he was married and settled on a farm in Pennsylvania, taking an active interest in politics, and became a member of a Committee of Safety, and studied military drill and tactics. At the outbreak of hostilities, he raised a regiment of volunteers, of which he was appointed colonel, and sent to Canada, where he covered the retreat of the provincial forces at Three Rivers. He commanded at Ticonderoga until 1777, when he was made Brigadier-general, and joined Washington in New Jersey; commanded the rearguard in the retreat at Brandywine; led the attack at Germantown; captured supplies for the distressed army at Valley Forge; distinguished himself at Monmouth; was defeated at Paoli; but achieved the most brilliant victory of the war in the storming of Stony Point (q. v.), July 15, 1779. His courage and skill saved Lafayette in Virginia in 1780; and he aided in the siege of Yorktown, and commanded in Georgia. At the close of the war, rewarded by popular enthusiasm, and having, by his dash and audacity, acquired the sobriquet of "Mad Anthony," he retired to his farm at Waynesborough, and engaged in promoting the construction of roads and canals. In 1792, he commanded a successful expedition against the Indians of the north-western territories; where he remained, until 1796, as United States Commissioner. He died at the garrison at Presque Isle (now Erie), December 14, 1796.

WAYS AND MEANS, Committee of, a committee of the House of Commons appointed to determine the modes of raising the money which the House—after resolutions reported from the Committee of Supply, and agreed to—has granted to the crown. Like the Committee of Supply, it is always a committee of the whole

* The name Wayland is from a root signifying art, cunning; from which come Eng. *wile* and (through old Fr.) *guile*. Aug.-Sax. *welan* means to fabricate.

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House. A chairman, elected by the Committee of Supply, but known as the Chairman of the Committee of Ways and Means, presides over both committees. One of the most important occasions for which the Committee sits is to receive the Budget, or annual financial statement of the year from the Chancellor of the Exchequer. The propositions of the government regarding loans, duties, taxes, tolls, and any other means for raising revenue, are submitted to the consideration of the Committee of Ways and Means in the shape of resolutions. The amount proposed to be raised must not exceed the sum granted in the Committee of Supply; and the Chancellor of the Exchequer is bound to satisfy the House, by a detail of the sums granted for the several services, that the amount of these sums will be a sufficient justification, in point of quantity, to the Committee of Ways and Means to adopt such measures and suppose such taxes as shall then be recommended. Such resolutions as are agreed to are adopted and embodied in bills, and in due time become law. See SUPPLY, COMMITTEE OF; PARLIAMENT.

WEALDEN FORMATION, a series of fresh-water strata belonging to the lower Cretaceous epoch. Having been originally studied in the parts of Kent, Surrey, and Sussex called the Weald, this local name was given to the formation. It has been divided into two series, which do not differ very materially from each other—viz., Weald Clay, 500 feet; Hastings Sand, 740; total, 1200. The Weald Clay consists of blue and brown clay and shale with thin beds of sandstone and shelly limestone. These strata were probably lake or estuary deposits, and contain the remains of the land flora and fauna, often in great abundance. The beds of limestone, called Sussex Marble, are almost entirely composed of a species of *Paludina*, not very different from the common *P. vivipara* of English rivers. The clays are often laminated by thin layers, consisting of immense numbers of the shells of minute *Cypridae*. But the most remarkable animal remains are those of the large reptiles which lived on the land, tenanted the air, or abounded in the sea, such as the *Iguanodon* (q. v.), *Hylæosaurus* (q. v.), *Pterodactyl* (q. v.), and the numerous species of turtles which have been described from these strata. The vegetable fossils belong chiefly to ferns, and to the gymnospermatus orders of Conifers and Cycads; the fruits of several species of both orders have been found; and in some places, the rolled trunks of *Endogenites* and *Clathraria*, belonging to Cycads, and of different species of coniferous wood, occur in enormous quantities, as at Brook Point, in the Isle of Wight, where the shore at low-water is strewn with them.

The Hastings beds contain more sandstone and less clay than those of the upper Weald Clays. The picturesque scenery of the High Rocks, and other places in the neighborhood of Tunbridge, is weathered out of the beds of white sandstone belonging to this period. The remains of the huge Wealden reptiles abound in the sandstones of this division. The Tilgate forest-beds, where Dr Mantell first found the *Iguanodon*, and the rocks in the neighborhood of Hastings, are the best known repositories of those remarkable fossils.

The deposition of the Wealden beds was followed by a gradual depression of the land, when these fresh-water deposits were covered by the estuary beds of the newer *Greensand*. The depression continued until the fresh-water and estuary strata formed the bottom of a deep sea, on which were deposited the immense beds of chalk and allied strata which form the bulk of the Cretaceous series. In the process of elevation, these beds have suffered denudation, so that districts which were covered with Cretaceous beds have been cleared of them, and immense valleys have been furrowed through the Chalk, Greensand, and Wealden.

WEALTH. See CAPITAL.

WEANING, AND FEEDING IN INFANCY. The propriety of mothers nursing their own children is now so universally acknowledged, that it is the duty of the physician less frequently to urge maternal nursing than to indicate those cases in which it becomes necessary to substitute another mode of rearing the infant. "Women," says Dr. Maunsell, "who labor under any mortal or weakening disease—as phthisis, hemorrhages, epilepsy—are obviously disqualified from the office of nurse. Some, who are in other respects healthy, have breasts incapable of secreting a sufficient supply of milk. In other instances, the breast may perform its functions well, but the nipple may be natu-

rally so small or may be so completely obliterated by the pressure of tight stays, as not to admit of its being laid hold of by the child. These are actual physical hindrances to nursing. Again, women may, and, in the higher classes, frequently do, possess such extremely sensitive and excitable temperaments, as will render it imprudent for them to suckle their own children. Frightened and excited by every accidental change in the infant's countenance, and inordinately moved by the common agitations of life, such persons are kept in a state of continual fever, which materially interferes with the formation of milk both as to quantity and quality. Women, also, who become mothers for the first time at a late period of life have seldom the flexibility of disposition or the physical aptitude for the secretion of milk, required to constitute a good nurse."—"A Treatise on the Management and Diseases of Children," 4th ed., 1842, pp. 39, 40. In ordinary cases, the child should be put to the breast as soon as the latter begins to contain anything; and when the secretion of milk has fairly commenced, it will require no other food until the seventh or eighth month, provided the mother be a good nurse. During the first five or six months, the infant should be put to the breast at regular intervals of about four hours; afterwards when the teeth are beginning to appear, the child need not suck more than four times in the twenty-four hours, some artificial food being given to it twice during the same period. This at first may consist of soft bread steeped in hot water, with the addition of sugar and cow's milk; and subsequently a little broth, free from salt and vegetables, may be given once a day. The spoon is now the best medium of feeding, as the food should be more solid than could be drawn through the sucking-bottle. The time of weaning should be that indicated by nature, when by providing the child with teeth, she furnishes it with the means of obtaining its nourishment from substances more solid than milk. If the infant has been gradually accustomed to a diminished supply of maternal and an increase of artificial food, weaning will be a comparatively easy process; and much of that suffering both to parent and child will be spared, which commonly ensues when a sudden change is made. In ordinary cases, the period of weaning varies from the seventh to the twelfth month; sometimes the child is kept at the breast for a much longer period, from the popular idea that lactation prevents pregnancy, but such unnaturally prolonged lactation is usually injurious to both mother and child.

In those cases in which it is inexpedient or impossible for a mother to suckle her own child, the choice of a wet-nurse becomes a subject of much importance. Upon this subject, Dr Maunsell lays down the following important practical rules: "The great thing we have to look to is to ascertain that both the woman and her child are in good health; and of this we must endeavor to judge by the following signs: The woman's general appearance and form should be observed and they ought to be such as betoken a sound constitution. Her skin should be free from eruptions; her tongue clean, and indicating a healthy digestion; her gums and teeth sound and perfect; the breasts should be firm and well formed—not too large or flabby—and with perfect, well-developed nipples. We should see that the milk flows freely, upon slight pressure; and we should allow a little of it to remain in a glass in order that we may judge of its quality. It should be thin, and of a bluish-white color; sweet to the taste; and when allowed to stand, should throw up a considerable quantity of cream. A nurse should not be old, but it is better that she should have had one or two children before, as she will then be likely to have more milk, and may be supposed to have acquired experience in the management of infants. Having examined the mother, we must next turn to the child, which should be well nourished, clean, and free from eruptions, especially on the head and buttocks. We should also carefully examine its mouth, to ascertain that it is free from sores or aphthae. If both woman and child bear such an examination, we may with tolerable security pronounce the former to be likely to prove a good nurse."—*Op. cit.*, pp. 44, 45. In one respect, we differ from this eminent physician. He holds that "the more recently the nurse's own confinement has taken place, provided she has recovered from its effects, the better." Supposing a nurse is required for a new-born infant, this rule holds good; but provided a nurse is required for an infant of three or four months old (for example), it is preferable to obtain a nurse whose milk is of that age. We believe it to be a general physiological law that the age of the milk should correspond to the age of the infant; that is to say, that an infant taken at any given age from its mother, be-

Wense.
Weather

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fore the normal period of weaning, should be provided with a nurse who was confided about the same time as its own mother.

A wet-nurse should be very much preferred to any kind of *artificial feeding*; but peculiar cases may occur in which it is impossible to procure a nurse; or an infant whose mother is incapable of nourishing it may be the subject of a disease that may be transmitted through the infant to the nurse. In these cases, a food must be provided as nearly as possible resembling the natural food; and this is naturally sought for among the food of animals. The milk of the cow is most commonly used, in consequence of its being the most easily obtained; but ass's milk more nearly resembles human milk, as is shewn from the following comparative analyses by Professor Playfair:

	Woman.	Cow.	Ass.
Casein	1.5	4.0	1.9
Butter	4.4	4.6	1.8
Sugar	5.7	3.8	6.3
Ashes	0.5	0.6	..
Water	88.0	89.0	90.5

The most important difference between cow's milk and woman's milk is the great excess of casein in the former. The former fluid may, however, be made to resemble the latter in composition in either of the following ways: (1) On gently heating cow's milk, a membrane of casein forms on the surface; by removing two or three of these membranes as they form, we can reduce the quantity of casein to the desired extent; or (2) we may dilute cow's milk with twice its bulk of pure water, and add a little sugar. This food should be administered at a natural temperature (of about 98°) through a sucking-bottle; and as the child grows older, it will soon be able to take natural cow's milk without inconvenience. The nature and importance of the mixture of milk and farinaceous food known as Liebig's Soup for Children, are described under *SOUP*.

The rules regarding the times, &c., of feeding, are similar to those laid down for suckling. Assuming that the infant, whether brought up at the breast or artificially reared, has been safely weaned, we have to consider what rules should be laid down regarding its food subsequently. For some months after weaning, the food should consist principally of semi-fluid substances, such as milk thickened with baked flour, or pap, to which a little sugar should be added. Light broths may also be administered, especially in the occasional cases in which milk seems to disagree; and bread and butter may be tried in small quantity. We shall conclude this article with the following "model of a suitable diet for children," which cannot be too strongly impressed upon the minds of all young mothers: "A healthy child, of two or three years old, commonly awakes hungry and thirsty at five or six o'clock in the morning, sometimes even earlier. Immediately after awaking, a little bread and sweet milk should be given to it, or (when the child is too young to eat bread) a little bread-pap. The latter should be warm; but in the former case, the bread may be eaten from the hand, and the milk allowed to be drunk cold, as it is well at this meal to furnish no inducement for eating beyond that of hunger. After eating, the child will generally sleep again for an hour or two; and about nine o'clock it should get its second meal, of bread softened in hot water, which latter is to be drained off, and fresh milk and a little sugar added to the bread. Between one and two, the child may have dinner, consisting, at the younger ages, of beef, mutton, or chicken broth (deprived of all fat), and bread. When a sufficient number of teeth are developed to admit of chewing being performed, a little animal food, as chicken, roast or boiled mutton, or beef, not too much dressed, should be allowed, with a potato or bread, and some fresh, well-dressed vegetable, as turnips or cauliflower. After dinner, some drink will be requisite; and a healthy child requires, and indeed wishes for nothing but water. Light, fresh table-beer would not be injurious to a child of four or five years old, but it is unnecessary. Between six and seven o'clock, the child may have its last meal of bread steeped in water, &c., as at nine o'clock in the morning. A healthy child which has been in the open air during the greater part of the day, will be ready for bed shortly after this last supply, and will require nothing more till next morning. Similar regimen and hours may be adopted throughout the whole period of childhood; only as the

fourth or fifth year approaches, giving, for breakfast and supper, bread and milk without water, and either warm or cold, according to the weather or the child's inclination. The supply of food upon first awakening in the morning may also be gradually discontinued, and breakfast be given somewhat earlier.—*Op. cit.*, pp. 80, 81.

WEA'SEL (*Mustela*), a genus of quadrupeds of the family *Mustelidae* (q. v.), having a very elongated body; short feet, with toes quite separate, and sharp claws; four molar teeth on each side above, and five below. The Common W. (*M. vulgaris*) is a native of almost all the temperate and cold parts of the northern hemisphere, except the most arctic regions. Its range does not extend quite so far north as that of the ermine. It is the smallest of the *Mustelidae* of the Old World, not exceeding two inches and a half in height, and seven inches and a half in length, from nose to tail; the tail about two inches and a half long, and terminating in a point, not so bushy as that of the stoat or ermine. The female is smaller than the male. The head is large; the ears short, broad, and rounded, the whiskers long. The color is reddish brown on the upper parts, sides, legs, and tail; the throat and belly white. The eyes are small, round and black, with a very keen expression, to which the whole habits of the animal correspond. It is nimble and active, bold, and yet wary. It may often be seen peeping curiously from a hole in a wall, but vainly does the schoolboy attempt to strike it with a stone. Catching it is out of the question for him, and so far well, for it is ready to bite severely. It is a most persevering hunter, its scent as keen as its sight, quarters the ground like a dog, and wears out animals larger and apparently much stronger than itself. It preys on mice, rats, voles, small birds, and other small animals, sometimes even on hares and rabbits, robs birds' nests, devouring the young birds or sucking the eggs, and is occasionally troublesome in poultry-yards, killing young chickens. It climbs walls and trees with great agility, and does not hesitate to plunge into water in pursuit of the water-rat. It sometimes begins by abstracting the blood of the animal which it has killed, and generally devours the brain; but when food is abundant, it carries the body to its retreat, where a considerable quantity of prey is often found, the W. preferring to eat it in a half-putrefied state. The W. generally sleeps during the day, and is most active at night. It has a disagreeable smell, which is strongest in hot weather, or when it has been pursued or irritated. It is capable of being tamed when young, and becomes docile and gentle. The female W. makes a nest of straw-leaves and moss for her young, which are produced in spring, four or five in a litter; often in a crevice of a bank, or in a hollow tree. The fur of the W. is an article of commerce in some northern countries, and W.-skins are exported in considerable quantity from Siberia to China. The W. sometimes, but rarely, becomes white in winter, like the ermine.—The Ermine (q. v.), or Stoat, is another species of weasel.—America has several species of W., of which one (*M. pusilla*) is rather smaller than the Common W. of Europe, and has a shorter tail. It is abundant in the northern parts of the United States, and its range extends far to the north. In the United States, it remains brown all winter; but in the fur-countries it becomes white.

WEA'THER is the condition of the atmosphere at any time in respect of heat, moisture, wind, rain, cloud, and electricity; and a change of weather implies a change in one or more of these elements. From the direct bearing weather-changes have on human interests, they have from the earliest times been closely watched, so that the causes by which they are brought about being discovered, their approach might be predicted with some degree of confidence. The craving in the popular mind for this knowledge is strongly attested by the prognostics of the weather current in every language, which, amid much that is shrewd and of considerable practical value, embrace more that is vague, and not a little that is positively absurd.

It is not necessary here to refer to Moore, Zadkiel, and other almanac-makers of that class, except as proving by their mere existence a wide-spread ignorance of even the most palpable elements of physical law, which is a disgrace to the educational system of the country. Prognosticators of higher pretensions repeatedly appear before the public, and it is curious to note how their predictions are eagerly laid hold of by the newspapers, and scattered broadcast over the country. Among the latest of this class was Mathieu de la Drome, whose predictions of storms and rains made so much noise, that the Emperor Napoleon requested the celebrated Leverrier to examine the grounds on which the predictions were founded. The exposure was complete. One of his principal predictions was based entirely on a high average of

the rainfall at a particular season. On examining the rainfall of the particular years of which the average had been taken, it was found that the excess was entirely due to an unprecedentedly heavy rain which occurred in one of the years at that season. His fame was founded on a few happy hits, and on his death occurring a short time after he began to issue predictions of the weather. One of the most remarkable predictions of recent times was that made by an Irish nobleman in reference to the weather of September 1865, which turned out to be in accordance with the prediction—dry, warm and fine, beyond precedent. The celebrity of this prediction has, however, been greatly reduced by other predictions made since, which the events unfortunately have not verified.

The changes of the moon were long, and in many minds are still, regarded as supplying the elements of prediction. In order to test the real value of the moon's changes on the weather, the Greenwich observations of 50 years were carefully examined, and it was found that the number of instances in which the weather was in accordance with the prognostication was one instance less than those in which the weather was different. When brought to the test of accurate examination and figures, the theory of the moon's changes on the coming weather is thus proved to be a complete delusion; but since most people have a bias towards forgetting the unsuccessful prognostications, and remembering the successful ones, the theory will likely continue to be believed in, at least until some knowledge of the natural laws be more generally diffused, so as to reveal its absurdity.

For some years, Mr Thomas du Boulay predicted the general character of the weather of each summer from the weather-conditions which prevailed during the week of the spring equinox preceding, believing that the general character of the weather of the next six months is already settled, and that it only requires the necessary skill to read its features, since these will remain generally constant till autumn. For a few years, he speculated in grain on the faith of the predictions, which turned out pretty correct. Latterly, the predictions have not been verified.

The truth is, that no prediction of the weather can be made, in the British Islands at least, for more than three, or perhaps only two days beforehand. Any attempt at a longer prediction is illusory. We would here refer to the article "Storms," as showing the possibility and mode of making real predictions of the weather. Almost all the weather changes of Europe begin from the south-west and pass over Great Britain to the north-east. Unsettled or bad weather is accompanied by a low barometer; elsewhere the barometer is higher. Thus, then, suppose, that from weather-telegrams received, it is seen that everywhere in Europe barometers are high, we may be sure that no storm need be dreaded for two days at least. But if, on the following morning, barometers begin to fall a little in the west of Ireland, and an easterly wind begins to grow generally over Great Britain and Norway, and a south-east wind over France; then, since the winds blow towards the lowest barometer, or rather a little towards the right of it, the presumption is that a storm of greater or less severity is coming up, the centre of which is likely to pass over England. This, ought, therefore, to be closely watched by the telegraph; and if the winds keep up in nearly the same direction, or veering slowly towards the south and west, increase in force, and barometers in the west of Ireland fall rapidly, a great storm is portended, of the approach of which warning should be at once telegraphed to the different seaports. But if, on the contrary, the winds do not increase in force, and the barometer fall slightly, or cease to fall, the storm has either passed considerably to the north of the British Islands, or its approach will be delayed for some time yet; and hence, no immediate warning is necessary.

It is our proximity to the Atlantic that makes it impossible to predict the weather beyond three days at the utmost. In Norway and the Baltic, and places towards the east of Europe, the weather may be predicted for a longer time, since each storm as it appears in the west may be followed in its course by the telegraph, and the places which it threatens be warned of the coming danger. In America also, where storms chiefly advance from west to east, gales and unsettled weather are predicted at the seaboard in the east some days before.

But the collecting of this information by the telegraph is a work which, owing to the expense, governments only can accomplish; and from its importance, it is an incumbent duty which they should discharge for the benefit of the seafaring popula-

tion. From the great value of weather-telegrams to persons interested in shipping, we believe that the time is not far distant when each of our chief seaports will be supplied with daily telegrams of the barometer and the winds from five or six places, at some distance, and in different directions, from the particular seaport. A good deal may, however, be done by each one for himself, by observing his barometer, the winds, and the face of the sky—especially the cirrus cloud—the most elevated and delicate of the clouds. But are these simple observations can be turned to account, and made the basis of an intelligent prediction, some knowledge of the general features of Storms (q. v.) is indispensable. These specially—(1) Storms have a circular area; and (2) advance in an easterly direction, bearing a low barometric pressure with them. (3) Winds blow from a high to a low barometer, and (4) with a force proportioned to the difference of the pressure. (5) Storms are first felt in the upper regions of the atmosphere, or in the region of the cirrus cloud; and (6) in front of the storm the air is warm and humid; in the rear of it, cold, or cool and dry. With such observations (requiring only a barometer), intelligently interpreted, particularly if hills form part of the landscape, the character of the weather may be foreseen for one day, or longer.

But though no prediction of the weather for weeks or months beforehand can be made with any pretensions to trustworthiness, yet guesses or surmises may be formed which are not without value. All observation goes to prove that predictions based on solar or other astronomical causes are without foundation, and that averages based on terrestrial observations are the only guides we have in this matter. Of this class are the interruptions which occur in the regular march of temperature in the course of a year. Thus, cold weather generally prevails from the 11th to the 14th of April—that is, the period of the "borrowing days" (O. S.), and in the second week of May; and these, with some other cold and warm periods, are almost co-extensive with the northern hemisphere of the globe. Hence, then, at these times, when the weather begins to get cold or warm, it may safely be predicted that such weather will last for several days. Again, if, after a long-continued prevalence of south-west winds, or the equatorial current, the polar current, or north-east wind, should set in, it is highly probable that easterly winds will prevail for some time; so that, if the season be winter, a continuance of frost, and perhaps snow, may be looked for; but if midsummer, the weather will become dry, warm, and bracing. But suppose easterly winds have been unusually predominant in autumn, and south-westerly winds begin to prevail in the end of November or beginning of December, it is most probable that the weather will continue exceptionally mild, with frequent heavy storms of wind and rain, till about Christmas. This period occurs nearly every year, and its commencement is popularly known as St. Martin's summer. If easterly winds preponderate greatly above the average during the spring months, the summer is likely to be characterised by south-westerly winds, with much rain and moisture, and little sunshine; but if easterly winds nearly fail in spring, the summer will be dry and warm, it being expected that the polar current will prevail in summer, bringing clear skies and brilliant sunshine. This latter forecast of the summer is believed in by the Rev. L. Jenyns, and several meteorologists of note; but an examination of the weather for a period of eleven years shows that it is only generally true.—See Rev. Leonard Jenyns' "Meteorology" (1858); "Popular Prognostics of the Weather in Scotland," by Arthur Mitchell, M. D.; "Journal of Scottish Meteorological Society, No. xlii."—"Interruptions of Temperature."

WEATHERING, a slight inclination given to the top of a cornice or moulding, to prevent water from lodging on it.

WEAVER-BIRD (*Ploceus*), a genus of birds of the Finch family (*Fringillidae*), of a group or sub-family (*Ploceinae*), to most of which the name Weaver-bird is extended. The name has reference to the remarkable structure of the nests of these birds, which are woven in a very wonderful manner of various vegetable substances, and are objects of great interest. The *Ploceinae* are natives of the warmer parts of Asia, of Africa, and of Australia; none being found in Europe nor in America. The species are numerous. They are small birds, with a strong conical bill, the ridge of which is slightly curved, the tip entire. The claws are large and very long. The wings are pointed, the first quill remarkably short. There is great diversity in

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the form and appearance of the nests constructed by different species. One of the best-known species is the PHILIPPINE WEAVER (*P. Philippinus*), the BAYA (q. v.) of India.—Many of the other weaver-birds construct nests pretty much on the same plan with this—pouches elongated into tubes, entering from below; those of some are kidney-shaped, and the entrance is in the side. They very generally suspend their nests in the same way from the extremities of branches, and often prefer branches which hang over water, probably as affording further security against monkeys, squirrels, snakes, and other enemies. Social habits are very prevalent among them, and many nests of the same species are often found close together. Some of them attach the nest of one year to that of the year preceding, as the *Placus pencilis* of Madagascar, which sometimes thus makes five nests in succession, one hanging to another. Some of the African species build their nests in company, the whole forming one structure. Thus the SOCIAL or REPUBLICAN W. of South Africa (*Plocus socius* or *Philacterus lepidus*) constructs a kind of umbrella-like roof, under which 800 or 1000 nests have been found, the nests like the cells of a honeycomb, and arranged with wonderful regularity. An acacia with straight smooth stem, such as predaceous animals cannot easily climb, is often selected by the bird-community. When the situation is chosen, the birds begin by constructing the roof, which is made of coarse grass, each pair afterwards building their own nest, which is attached to the roof. As new nests are built every year the weight of the structure often becomes so great as to break down its support.—*Troglodytes erythrorhynchus* is a bird of the W. group, which is commonly seen in South Africa accompanying herds of buffaloes, and feeding on the bots and other insects which infest them, alighting on their backs to pick them out of the hide. The bird is often of great use to the buffalo in another way, by giving warning of the approach of an enemy.—The Whydew Birds (q. v.), or Widow Birds, likewise belong to the group of *Plocinae*.

WEAVING, the art by which threads or yarns of any substance are interlaced so as to form a continuous web. It is perhaps the most ancient of the manufacturing arts, for clothing was always a first necessity of mankind. The methods by which weaving is now accomplished have been explained and illustrated under LOOM (q. v.); it therefore only remains to describe the variations which may be effected by ingenious applications of the powers of the loom; and as these are almost endless, some of the more common and easily understood will be chosen. The simplest form of weaving is that employed in making the mats of uncivilised nations. These consist of single untwisted fibres, usually vegetable, arranged side by side to the width required, and of the length of the fibres themselves, which are tied at each end to a stick, which is so fixed as to keep the fibres straight, and on the same plane. Then the weaver lifts up every other of these longitudinal threads, and passes under it a transverse one, which he first attaches by tying or twisting to the outermost fibre of the side he commences with, and afterwards in the same way to that on the other side, when it has passed through the whole series. The acquisition of the art of spinning threads of any length enables more advanced nations to give great length to the warp, or series of threads which are first arranged, and to pass the weft or transverse thread backwards and forwards by means of a shuttle, without the necessity of fixing at the sides. The mechanical appliances already described under LOOM add these operations to an amazing extent. That kind of weaving which consists of passing the weft alternately over and under each thread of the warp is called *plain weaving*; but if the weaver takes up first one and then two threads alternately of the warp series, and passes the weft under them for the first shoot of his shuttle, and raises those which were left down before for the second shoot, he produces a cloth with a very different appearance, called *TWILL* (q. v.), many varieties of which may be produced by varying the numbers missed or taken up—as, for example, one and three, instead of one and two.

There are few arts which require more patience or skill than weaving. As many as from one to two thousand threads often constitute the warp; and these threads may be so varied in quality (see YARN) as to produce many varieties of fabric. From that cause alone, there are almost infinite variations. Many may be produced by the order in which the threads are lifted for the passage of the weft—that of itself can also vary as much or more in its quality and other circumstances, so that the inventive genius of the weaver finds incessant opportunities for its display, and

nice arithmetical calculations are required in estimating and allotting the numerous threads to the endless variety of patterns which are constantly passing through the looms. A really practical knowledge of weaving can only be obtained by working with looms, and studying such technical treatises as Watson's "Theory and Practice of the Art of Weaving," and some of the elaborate treatises by the French weavers.

WEAVING. There is no branch of manufacture in which inventions and improvements are more rapidly succeeding each other than in weaving; but, as a rule, they are of minor importance, and rarely affect the general principles of the process. In 1867, however, the novelty of *Convex* weaving by machinery was introduced, and although only at present applied to ladies' stays, seems to promise a wide application to clothing generally, and many other purposes.

Out of the numerous attempts that have been made during the last ten years to weave by machinery a convex surface, such as is required in several articles of clothing, hardly one, up to the present time, has succeeded. This failure has been owing partly to deficiencies in the various inventions of this kind, and partly to the costliness of carrying them out. At last, after long and patient trials, a patent convex weaving-loom has been invented that not only answers all the purposes of the hand-loom, hitherto exclusively used, but also possesses the advantage, which is absolutely necessary in a country where labor is scarce, of doing ten times the amount of work in the same space of time. With the hand-loom, one man can make, at the very utmost, only four pair of stays in a day, whereas the new-invented convex weaving-machine turns out 40 pair daily. The superior lightness and flexibility of woven stays, and their perfect freedom from hard seams, have increased to a very large extent the demand for this class of goods. Up to the present moment, hand-labor alone has been employed in France and Württemberg, two countries where they have been most extensively manufactured. In the United States, however, where the high wages for hand-labor have necessitated the most extensive use of machinery, this system could not be adopted with any possibility of pecuniary success; and, in consequence of this fact, a loom for weaving of stays and other convex goods had to be invented. This loom, which was constructed under the superintendence of M. Upper, for the Convex Weaving Company in New York, does the work automatically and to perfection.

The principle of a constant length of travel for the shuttle was adopted for the sake of simplicity; but, as it is necessary, in weaving the gores, that the weft-thread should pass through only a part of the breadth of the warp, the Jacquard has been employed for the purpose of taking up the portion of the warp required to be woven in that part. It is impossible by mere verbal description to give any adequate notion of this ingenious machine without seeing it in operation.

WEBER, Carl Maria von, a musical composer of high eminence, was born at Eutin in Holstein, 18th December 1786. Musical and dramatic talent has been hereditary in his family for some generations; his father, by turns officer in the army of the Palatinate, finance minister of the Elector of Cologne, music-director to the Prince Bishop of Eutin, and head of a company of strolling players, led a somewhat irregular and checkered life. Young W. showed early a genius for music, but his instructors were often changed, in consequence of his father's change of residence. The teachers to whom he owed most were Haenschke at Hildburghausen, Michael Haydn at Salzburg, and Valesi and Kalcher at Munich. His father's impatience and want of judgment were injurious to him in many ways, particularly in the efforts made to bring him before the public prematurely as a musical prodigy. At the age of 18, he composed an opera called "Die Macht der Liebe und des Weins." When but 14, his second opera, "Das Waldmädchen," was brought out, without much success at first; but was afterwards far better received than he himself thought it deserved. The next effort of the young opera-composer was "Peter Schmoll und seine Nachbarn," composed at Salzburg in 1801, and performed at Vienna with but indifferent success. At Vienna, he became acquainted in 1803, with Joseph Haydn and the Abbé Vogler, and studied for some time under the latter. In 1804, he left Vienna, to be conductor of the opera at Breslau, and while resident there, composed the greater part of his opera of "Hänsel." We next find him, in 1806, with Prince Eugène of Württemberg, at his court of Carlsruhe in

Silesia, where he composed two symphonies and three concertos. In 1867, he went to Stuttgart, as private secretary to Duke Ludwig, becoming also musical instructor to his children; and while there, he composed the opera of "Silvana," and a cantata called "Der erste Ton," besides overtures, choral pieces, and pianoforte works. Getting into disfavor and pecuniary embarrassments, the result of his father's recklessness, he was dismissed the court of Württemberg, and took up his residence successively in Mannheim, Heidelberg, and Darmstadt, at which last place he composed his operetta of "Abu Hassan." He then made a musical tour through Germany, during which his concerts were everywhere well attended. From 1818 to 1816, he was director of the opera at Prague, which he entirely remodelled; and during his residence in the Bohemian capital composed "Kampf und Sieg," and numerous other songs, including that noble national series from Körner's "Leder und Schwert," which had no little influence in rousing patriotic sentiment during the war of liberation.

In 1817, he was invited to form a German Opera at Dresden; and there, during the remainder of his life, he held the post of "Kapellmeister" to the king of Saxony. To this period belong his most important compositions, including "Preciosa," "Der Freischütz," "Euryanthe," and "Oberon." None of these works, however, were first brought out in Dresden. The music to Wolff's "Preciosa," the subject of which is taken from a novel by Cervantes, was first produced on the Berlin stage, where it made a powerful impression. The author's "chef-d'œuvre," the opera of "Freischütz," the libretto of which was written by the composer's friend, Friedrich Kind, also first saw the light in the Prussian capital in 1821. It was a great success: its novelty and beauty, as well as the deep thought contained in it, excited an extraordinary sensation throughout Germany which soon extended to France and England. "Euryanthe," produced in Vienna in 1823, was not quite so warmly received. Bearing more the impress of labour and cultivation, and less that of the composer's natural vein of romance, it has never been in such general favour as its predecessor. "Oberon" was written in prospect of a visit to London to a libretto supplied by Mr. Panché. When W. set out for England, he was already struggling against mortal disease. On the 8th March 1826, he appeared at Covent Garden Theatre as conductor of a selection from "Freischütz;" and on the 19th of April following he also conducted, on the first appearance of "Oberon," with applause on both occasions, incessant and uproarious. At his benefit concert on the 26th of May, he was hardly able to go through the duty of conductor; and on the 6th of June he was found dead in bed in the house of Sir George Sinaur, whose guest he was. He was interred in the Roman Catholic Church, Moorfields; but in 1844, his body was removed to Dresden; and a statue of him by Reichel was erected in 1860 in front of the Dresden theatre. W. was married in 1818 to Carolina Brandt, an operatic singer of some note, daughter of Brandt the violinist, by whom he left a family.

The verdict of posterity, as well as of his contemporaries, has placed W. in the first rank of musical composers. He was the first to use those bold effects of harmony and modulation whose introduction forms an era in the history of music. In his operas, the spirit of the romantic school appears in its brightest and most captivating form; and the overtures are masterpieces of imagination, each presenting an outline of the work to which it belongs. Besides the above operas and songs, his musical works are numerous, comprising concertos for the pianoforte, clarinet, oboe, bassoon, and violoncello—symphonies and overtures, one of the most beautiful and characteristic of them being the overture to the "Bekehrter der Geister." Among his posthumous writings is an Autobiography. His Life has been written by his son, Baron Max Maria von Weber, and recently translated into English by Mr. Palgrave Simpson.

WEBSTER, Daniel, American statesman and jurist, was born at Sallebury, New Hampshire, January 18, 1782, the second son of Ebenezer Webster, a small farmer, and justice of the county court. He entered Dartmouth College in 1797, and taught school in winter to pay his expenses, and aid his brother, Ezekiel, who became a distinguished lawyer, in fitting for college. On graduating in 1801, he commenced to study law, but was induced, by the offer of a salary of \$50 dollars a year, to become preceptor of an academy at Fryburg, Maine, paying his board by copying deeds. In 1804, he went to Boston, and entered the law office of Mr. Gore, refusing an appointment of clerk of the court of which his father was a judge, at

1500 dollars a year. In 1806, having been admitted to the Boston bar, he established himself at Portsmouth, New Hampshire; married in 1808; and having engaged in politics as a member of the Federalist party, was elected to Congress, where he immediately took rank with the foremost men of the country. His speech on the Berlin and Milan Decrees, and his mastery of the question of currency and finance, gave him a high position; but he determined, in 1816, to remove to Boston, where, leaving politics, he engaged for several years in legal practice of the most extensive and varied character. In 1822, he was a member of the Massachusetts Constitutional Convention; and December 22, 1823, he pronounced at Plymouth, on the anniversary of the landing of the Pilgrims, the first of that remarkable series of discourses, or orations, which gave him the first rank among American orators. In 1825 he gave an oration at the laying of the corner stone of the Bunker Hill Monument; in 1845, one on its completion. In 1826, he pronounced the eulogy of John Adams and Thomas Jefferson, two fathers and Presidents of the American republic, who died on the same semi-centenary anniversary of the Declaration of Independence; and in 1851, a patriotic discourse on the laying of the corner stone for the extension of the Capitol at Washington. In 1823 he was elected to Congress from Boston, and was distinguished by his speeches on the Holy Alliance and the Greek Revolution, and his labors in the revision of the criminal laws of the United States. In 1826, he was chosen Senator; and in 1830, rose to the height of his forensic renown in a speech of two days, in the debate with Mr Hayne, of South Carolina, on the right of "nullification." W. and Clay were the leaders of the opposition during the administrations of Jackson and Van Buren. In 1839, he visited England, Scotland and France; and in 1841, accepted the post of Secretary of State in the Cabinet of General Harrison, and remained in that of Mr Tyler, who, as Vice-President, succeeded on the death of the President, until 1843. In 1844, he aspired to the presidency, but the choice of his party fell upon Mr Clay, whom he supported, but unsuccessfully. He was chosen senator for Massachusetts, and again in 1845 was disappointed of the presidential nomination by the popular enthusiasm for the victor of Buena Vista, General Taylor. His senatorial efforts at this period were directed to the preservation of the Union by the advocacy of compromises on the slavery question, and he gave offence to the Abolitionists by defending the Fugitive Slave Law. In 1850, he became again Secretary of State in the cabinet of Mr Fillmore; and in 1853 was once more, and no doubt grievously disappointed at not receiving the nomination to the presidency, which was given to General Scott. He did not live to see the defeat of his rival; but after a brief illness, died at his country residence at Marshfield, Massachusetts, October 24, 1853. Mr W. was a man of very striking appearance, large, swarthy, with deep-set eyes, a deep, powerful voice, and a solemn and earnest manner. His collected writings and speeches have been published (6 vols. 8vo, 1851), and his Correspondence (3 vols. 8vo, 1855).

WEBSTER, Noah, American author and philologist, was born at Hartford, Connecticut, October 16, 1759, and entered Yale College in 1774. In his third college year, he served under his father, a militia captain, in the war of the Revolution. He was admitted to the bar in 1781, but engaged in scholastic and literary occupations. Employed in teaching a school at Goshen, New York, he prepared his "Grammatical Institutes of the English Language," published in three parts; and edited "Governor Winthrop's Journal." In 1786, he wrote "Sketches of American Policy," advocating the formation of a new constitution, and gave public lectures on the English language, which were published in 1789. He taught an academy in Philadelphia, and wrote on the Constitution; and in 1788, published the "American Magazine" in New York. After a few years' law practice at Hartford, he engaged, in 1793, in the editorship of the "Minerva," a Federalist daily paper in New York. In 1799, he published "A Brief History of Epidemic and Pestilential Diseases," the yellow fever having broken out in New York; and pamphlets on International Law, Banking, and Finance. In 1807, he published "A Philosophical and Practical Grammar of the English Language," and commenced his "American Dictionary of the English Language;" but finding difficulties in etymology, he devoted ten years to its study, and prepared a "Synopsis of Words in Twenty Languages;" then began his Dictionary anew, and in seven years completed it. In 1824, he came to Europe, to consult books and learned men, spending some months at Paris and at Cambridge. In 1838, an edition of 2500 copies of his Dictionary, in 3 vols. 4to, was

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issued; followed by one of 3000 copies in England. Numerous abridgments have been made, which found a large sale. His "Elementary Spelling-book," founded on his "Institutes," up to 1863, had been sold to the extent of 41,000,000 copies. A new and thoroughly revised and enlarged edition of his dictionary was finished in 1866, and it is now perhaps the most complete dictionary of the English language yet published. Mr. W. also published a popular "History of the United States," and a "Manual of Useful Studies." He was a judge, a member of the State legislature, and one of the founders of Amherst College. He died at New Haven, May 28, 1843.

WEDGE, one of the mechanical powers, and in principle a modification of the inclined plane. The power is applied by pressure, or more generally by percussion, to the back, thus forcing the wedge forwards. The wedge is employed for such purposes as the splitting of wood, the fastening firmly of the handle of an axe, the raising of a ship in a dry dock, &c. The investigation on statical principles of the mechanical advantage of the wedge is extremely unsatisfactory, the power, which is scarcely ever a "pressure," being always assumed to be one, and the enormous friction on the sides of the wedge being generally neglected; the theoretical result thus arrived at is that the pressure applied at the back: the resistance or weight :: $\frac{1}{2}$ width of back of wedge : length of side. In the application of the wedge to the splitting of wood in the direction of the fibres, the split generally extends some distance in advance of the edge of the wedge, and the action of the latter is then a combination of the action of the wedge with that of the lever; in fact, this compound action is found more or less in all applications of the wedge as a cutting or splitting weapon, and tends further to complicate the statical investigation of its mechanical properties. The best and simplest illustration of the single wedge are axes, nails, plugs, planes, chisels, needles, and all sharp-pointed instruments.

WEDGWOOD, Josiah, the creator of British pottery as an art, was born at Burslem, in Staffordshire, in the year 1730. His father was a potter, and very early he was set to work at the same business. His education seems to have been of the scantiest. After an abortive attempt to settle himself at Stoke with a partner named Harrison, he returned to his native place, and there commenced business as a potter. From the first, his ardor for the improvement of the manufacture was conspicuous. His first efforts were directed to the refining of the material, and soon he succeeded in producing a beautiful cream-colored porcelain, which became popularly known as Queen's Ware, Queen Charlotte having much admired it, and extended her patronage to the manufacturer. Subsequently, other improved materials were produced. The attention of W. was not less assiduously directed to considerations of form and decoration; he busied himself in emulating the grace of the antique models; and the celebrated sculptor, Flaxman, was employed to furnish designs to him. In this way, what he found a rude and barbarous manufacture, he raised to the level of a fine art; and he found his reward in the speedy amassing of an immense fortune. In 1771, he removed his works some little way from Burslem; and to the new site he gave the fanciful name *Etruria*, as that of the country of old most celebrated for the beauty of its ceramic products. Here he built himself a splendid mansion; and here, in 1795, he died.

Apart from his eminence in the art to which he mainly devoted himself, W. was a man of considerable culture. Natural philosophy, in particular, he studied with much success. He was a fellow of the Royal Society, as also of the Society of Antiquaries; and to the "Philosophical Transactions" he from time to time contributed papers. He likewise interested himself deeply in all matters of public concernment; and mainly through his influence it was that the Grand Trunk Canal, uniting the waters of the Mersey, the Trent, and the Severn, was carried out. He was a man of much benevolence of character, and the prosperity which flowed upon him through life, he distinguished by the exercise of an almost princely liberality.

Full particulars as regards this remarkable man may be found in two lives of him published in 1868, one by Eliza Meteyard, the other by Llewellyn Jewett. See also Eliza Meteyard's "Memorials of Wedgwood" (1875), and "Wedgwood Hand-book" (1875).

WEDGWOOD WARE, a beautiful kind of pottery invented by Josiah Wedg-

wood in 1775. It consists of flint, Potter's clay, carbonate and sulphate of barytes, and zaffre, or some other coloring material. It is also called Jasper Ware. The beautiful classical designs on the earliest productions of this manufacture were many of them executed by Flaxman, and are very highly valued.

WEDNESBURY, a market-town in the south of Staffordshire, in a district abounding in canals, coal mines, and iron-works, $7\frac{1}{2}$ miles north-west of Birmingham by railway. It was called Wredesbury by the Saxons, and for a long time took precedence, in point of population and historical importance, of Birmingham and Wolverhampton. It was here that the great coal-field of Staffordshire was first worked. W. contains large works for the manufacture of railway plant; it produces also edge-tools, coach ironmongery, locks, screws, gun-locks and barrels, gas and water pipes. The town has been greatly improved by a Local Board of Health, appointed in 1865. By the Reform Act of 1867, W.—comprising also Bromwich and Tipton—was erected into a parliamentary borough, returning one member to the House of Commons. Pop. (1871) of town, 25,090; of parliamentary borough, 116,809.

WEDNESDAY, the fourth day of the week, the *Dies Mercurii* of the Romans, the *Mittwoch* (mid-week) of the modern Germans. The name Wednesday is derived from the northern mythology, and signifies Wodin's or Odin's day. The Anglo-Saxon form was *Wōdanes dag*, the old German *Wuotanes tag*. The Swedish and Danish is *Onsdag*.

WEEBO, or Ibo, a small island off the coast of Mozambique, belonging to the Portuguese, about 150 miles south of Cape Delgado. The town is clean, with neatly-built houses; there are three forts, one of which serves as barracks for the garrison, and, though contemptible as a defensive work against a well-organized enemy, it is well adapted for resisting the natives, between whom and the Portuguese all along the Mozambique coast, there seems to be perpetual hostility. The pop. consists of nearly 8000 natives and a few Europeans; and though an important trade in ivory, copal, &c., is said to be carried on, there are few signs of activity in the harbor, and the natives for the most part seem miserable, fever-stricken wretches.

WEED, Thurlow, American journalist, was born at Cairo, New York, November 15, 1797, and at the age of 10 years was cabin-boy on a sloop on the Hudson River; at 13 he was an apprentice in the printing-office of Mr Croswell at Catskill; then lived for a short time in a backwoods settlement, but at 14 returned to printing. He was a volunteer in the war of 1812, and at the age of 21 established a newspaper in Western New York, and during the Anti-Masonic excitement, was elected to the state legislature, 1836—1837, where his peculiar and almost unrivalled abilities as a political manager or "wire-puller" were early recognised. In 1830 he settled at Albany, the state capital, and commenced the publication of the "Evening Journal," an anti-Jackson, whig, or republican paper, which became the organ of the party, and of the state government when its party was in power. Declining all offices for himself, except the profitable one of state printer, he is supposed to have exercised almost supreme influence in nominations and appointments, and to have secured the choice of Presidents Harrison and Taylor; was through his whole career the friend and adviser of Mr Seward. In 1861, he was sent in a semi-diplomatic capacity to Europe, and on his return was presented with the freedom of the city of New York, where he became part proprietor and one of the editors of the "New York Times," and subsequently editor of the "Commercial Advertiser." In 1866, he published "Letters from Europe and the West Indies."

WEED (*Lymphangitis*), or a Shot of Grease, consists in inflammation of the large absorbent glands and vessels situated between the horse's thighs. Rarely, it attacks the corresponding structures between the fore-limbs. It occurs in round-limbed, indifferently bred, hard-wrought horses; appears particularly after a day or two of rest, after exposure to cold, or during imperfect action of the bowels; and is said to depend upon more blood being produced than is required to replace the natural waste of the body. It is identified by lameness, tenderness in the groin, and fever. The horse must be bled, have a full dose of aloes, and when the pain and tenderness are great, ten drops of Flemmg's Tincture of Aconite in water every two hours; the limb should be bathed for at least six or eight hours continuously in hot

water, and then rubbed dry and kept warm. The subsequent swelling will be reduced by saline draughts, diuretics, rubbing of the limb, and exercise.

WEEDS, the name given to all those plants which grow wild in cultivated grounds, and injure the crops; which they do both by choking them, and by exhausting the soil. Those weeds which are annuals or biennials, as charlock, yellow rattle, and mallow, may gradually be got quit of by merely cultivating, for a succession of years, such plants as are to be cut before the seeds of the weeds are fully ripe. Perennial weeds, such as couch grass, can only be removed from the ground by repeated and careful tilling; and for this purpose, crops which require much hoeing are advantageously planted, and recourse is had to summer fallowing in fields, and frequent weeding in gardens. Thistles and other large weeds are frequently pulled in corn-fields before the corn comes into ear, and to prevent their seedling, they are cut in pastures. Sedges and rushes, which spring up in a great abundance in damp grounds, disappear on thorough draining. Leafy crops which thickly cover the soil, prevent the growth of many weeds by the exclusion of air and light. Weeds which have been rooted up form excellent compost for manure. Those which make their appearance in fallow grounds, serve for green manuring when they are ploughed down.

WEEK (Goth. *Vico*; Old High-German, *Wekka*—order, cycle (7); Lat. *Vicis*; Gr. *Hebdomas Sabbaton*; Heb. *Shabna* from *Sheba*, seven) designates generally a period of seven days. It was probably first instituted as a kind of broad subdivision of the periodical month, corresponding to the four quarters of the moon, or about $7\frac{1}{2}$ days. Although found as a civil institution among some nations at the earliest time—e. g., with the Hindus, Assyrians, Persians, &c., it is only with the Jews that we see a religious signification given to the concluding or seventh day of that period itself. Both their cosmogony and legislation are connected with it. The Sabbath (q. v.) is emphatically the day of rest, while seven weeks after the Passover the Pentecost, or Feast of Weeks takes place, &c. (see **SEVEN**). It is doubtful whether it was through the Jews that this computation of weeks was introduced to the Egyptians, but it is certain that the latter at an early period counted seven periodical days, naming them according to the seven planets then assumed. The application of the names of the planets to the days of the week in the order they now stand, originated in this way: It was an astrological notion that each planet in order presided over an hour of the day, the order, according to their distances from the earth, being on the geocentric system, Saturn, Jupiter, Mars, the sun, Venus, Mercury, the moon. Assuming Saturn to preside over the first hour of Saturday, and assigning to each succeeding hour a planet in order, the 22d hour will fall again to Saturn, the 23d to Jupiter, the 24th to Mars, and the first hour of the next day to the sun; in the same way, the first hour of the following day falls to the moon, and so on. From Alexandria, this seven days' week was imported, together with the names of the individual days, to the Greeks—who previously divided their months into three decades—and to the Romans, about the time of Christ. Rome had previously counted her periods by eight days, the eighth day itself being originally called *Nundine*—a term later applied to the whole cycle—as returning *novo quoque die*, when the country people were in the habit of coming to town for the purposes of business, and chiefly to inquire after public news, the changes in government and legislation, vacant places, and the rest. But the seven days' cycle soon found great favor among the Romans, owing partly, perhaps, to the spread of Egyptian astrology, although the change was not officially introduced before Constantine. It is certain that the Jewish name Sabbath came into use in Rome, and from Rome it spread to all the Romance languages, even into the German. It survives in the Italian *Sabbato*, the Spanish *Sábado*, the French *Samedi* (*Sabbati dies*), and the German *Sambaztag*, which afterwards became *Samstag*. In the same manner, the Latin *Septimana* (the Greek *hebdomas*) has become the modern designation for week in the Italian *Settimana*, Span. *Semana*, French *Semaine*, and even in the Irish *Seachtmaíne*. The *Codex Theodosianus* is the first document which adopts the term *Septimana* in the meaning of weeks. The Jews, as well as the early Christians, had no special names for the single days, but counted their number from the previous Sabbath, beginning with Sunday, as the first after the Sabbath, and ending with Friday, as the sixth after the previous, or eve (*Ereb*) of the next Sabbath. After a

very short time, however, young Christianity, which in the same manner had endeavored to count from the *feria secunda*, or second day after Sunday, to the *Septima* (or Saturday), had to fall back again upon the old heathen names, previously introduced in Gaul, Germany, &c. by the heathen Romans. The Sunday, or *dies Solis*, alone was changed in many of the Romanic languages in accordance with the new creed. It was called *Kyriake*, *dies Dominicus* or *Dominica*, the Day of the Lord, a term which in Italian became *Domenica*, in Spanish *Domingo* and *Dimanche* in French. The Germanic *Frōntao* (from *frōn* = *dominicus*) occurs but once. It is very curious to notice how the names of the five days of the week which followed those named after the sun and moon, became Germanised, as it were, or the names of the originally imported gods translated into those of the Germanic divinities. Thus, the day of Mars became that of *Zin* (see *TRA*). Mercury became *Wodan*; and the fourth day was called after the latter, in Dutch, English, and Scandinavian; while in Germany it was simply called the middle of the week = *Mittwoch*. The day of Jupiter became the day of *Thor* = *Thursdag*, *Donnerstag*; while the *Dies Veneris* was transformed into the day of *Freya*, the wife of *Odin* (*Wodan*). The day of Saturnus, retained under this name in some northern tongues, became a *langardage*, or bathing-day, in others; while in Upper Germany it remained a Sunday-eve (*feria ante dominicam*) or *Samstag* (see above). From recent discoveries of Assyriologists, it seems certain that the Assyrians, and through them probably the other Semitic nations, derived their week of seven days from the Accadians or early Turanian inhabitants of Babylonia, who also observed the seventh day as a day of rest. To this remarkable people are also to be traced the planetary names which we still give to the days of the week. The Arabs, like the Jews, count their days (beginning and ending with sunset) by sevens, without giving them planetary names. Greeks, Slavs, and Finns also count their days from Sunday, instead of naming them. The French Revolution altered the seven days' week into a decade of ten days; but the new computation introduced in 1798 was abrogated again in 1806. The "weeks of years," in Hebrew prophetic poetry (like the Roman *annorum hebdomadae*), indicate cycles of seven years.—See *Ideler's "Chronologie"* (1881); *Grimm's "Deutsche Mythologie"* (1885); and *Leuonant's "La Magie chez les Chaldéens"* (1874).

WEEKS, FEAST OF (Gr. *Pentecoste* = fiftieth, Heb. *Shabuoth*, also called Feast of Harvest, Day of the First-fruits, &c.), the second of the three great *Regalia* or Pilgrim Feasts of the Old Testament, was celebrated seven weeks, or forty-nine days, after the Passover. As the latter was the feast of the barley harvest, so the former was that of the wheat harvest. The first two loaves of the new crop were offered up on the day of the festival—leavened, and containing about $3\frac{1}{4}$ quarts each (the Mishnah speaks of their being 7 inches by 8), together with a peace-offering of two lambs. Besides this, a great burnt and sin offering—the former consisting of seven lambs, a bullock, two rams, together with the appropriate meat and drink offerings; the latter of one kid—were added, according to *Leviticus* (xxiii. 18); while *Numbers* (xxviii. 27) increases the number of the bullocks to two, and only mentions one ram—a number more in accordance with the regulations for the other festive sacrifices. The Jewish tradition, however, considers the animals mentioned in the later passage as an additional sacrifice; and Josephus has indeed added both up, except in as far as the rams are concerned, of which he only gives two. Tradition has given to this feast, which originally was only intended to represent the solemn closing of the harvest, a new significance by making it the anniversary of the Sinaitic Legislation, which indeed must have taken place in the first days of the third month. But the Pentecost, which is always fixed in the Jewish calendar on the 6th of Sivan, could not, before the establishment of astronomical computation, fall always on the same day, but must needs have fallen between the 6th and 7th of that month. Moses himself nowhere fixes the date of this festival as he does with the others. The Karaites, instead of referring the "morning of [after] the Sabbath" of *Lev.* (xxiii. 15) to the 16th of Nisan, take it literally, and celebrate the festival always on a Sabbath. The uncertainty of the lunar calculation and observation among the Jews of the Dispersion, caused them also to add one day to this festival—a usage still retained at present. There seems to have been more of the character of a harvest-home inherent in this festival than in the Passover, which partook particularly of the character of a large and solemn family-gathering. For the Christian adoption of this festival, see **PENTECOST**.

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WEEPING TREES are trees with remarkably elongated and pendulous branchlets, generally mere varieties of species which ordinarily have a different habit, as the Weeping Birch, Weeping Ash, and Weeping Willow, which are varieties of the Common Birch, Common Ash, and White or Huntingdon Willow. The Weeping Birch occurs in a wild state in some places in the Highlands of Scotland, and is a characteristic ornament of the landscape. Trees intermediate in their habit between the Weeping Birch and the common variety are of very frequent occurrence. Weeping trees are much esteemed for ornamental purposes, and are not only very beautiful in themselves, but as a contrast to other trees in lawns and pleasure-grounds. They are therefore carefully propagated in nurseries. The Weeping Ash is often grafted on the Common Ash, but the result is seldom very satisfactory, the art of the gardener forcing itself too much upon attention. A tendency to the weeping habit of elongated and pendulous branchlets is manifested in some kinds of trees, as the tendency to vary into a very opposite habit, with the branchlets drawn up very close together (var. *stricta* of botanists), appears in others, of which the Swedish Juniper and the Irish Yew are familiar examples.

WEERT, an unwall'd town in the Netherlands, province of Limburg, 13 miles west-north-west of Roermond, on the ship-canal from Maastricht to 's Hertogenbosch. Pop. (1875) 7136. There are several good schools, a collegiate institution, town-house, two churches, and three market-places. In the Church of St. Martin is the grave of the Count of Hoorn, who was beheaded at Brussels, in 1568, for adhering to the Prince of Orange in the struggle for religious and political freedom. A beautiful promenade leads to the other church, outside the town, north of which are the ruins of the old castle. Besides the markets for farm produce, horses, and pigs, W. has factories for making cloth, stockings, and hats, corn and oil mills. Here was born, 1594, Jan van Weert, who, in boyhood a shoemaker's apprentice, became commander of the Austrian army and viceroy of Bohemia.

WEEVER, or Sting-fish (*Trachinus*), a genus of acanthopteron fishes of the family *Uranoscopidae*, also called *Trachinidae*. In this family the ventrals are composed of a spine and five jointed rays, and are generally situated before the pectorals. The scales are cycloid, or wanting. The eyeballs are capable of being raised in a remarkable manner out of their sockets, and of being retracted again to the level of the orbits. The species frequent the bottom of the sea. They are often furnished with barbels, and have also a peculiar membranous filament under the tongue, which they can protrude at pleasure. In the genus *Trachinus* the head is compressed, the eyes are placed high and close together; there is a long sharp spine on the hinder part of the gill-cover. There are two dorsal fins; the second dorsal and the anal are long; the ventrals are close to the throat. Two species are found on the British coasts, the GREATER W. or STING BULL (*T. draco*) and the LITTLE W. or VIPER W. (*T. vipera*). The former attains a length of nearly one foot; the latter, seldom of more than four or five inches. The general form is long, narrow, and compressed; the Little W. is proportionally deeper in body than the Greater Weever. The head of both is short compressed, flat between the eyes, and rough on the summit; both dorsals and the anal fins are spiny; and in both the gill-cover is furnished with a strong and sharp spine, which is directed backward, and can be appressed to the body, but which is also capable of being made to stand out so as to present its point to an adversary. Both species are of a yellowish brown color. They inhabit parts of the sea having a sandy bottom, and often partially bury themselves in the sand, but are ready to move off with great celerity if disturbed. They can live long out of the water; and if left by the retreating tide, suffer no inconvenience. If assailed, they can, by a sudden bending of the body, make use of one of the strong spines of the gill-covers against the assailant; and the wound thus inflicted is so severe, as to lend to the opinion that the spine is coated with a venomous exudation. Naturalists, however, generally supposed the popular opinion to be erroneous, and the severity of the wound to be merely owing to the laceration effected by the spine, until it was discovered by Dr Günther, in 1864, that poison-glands existed in connection with spines of some South American fishes of the family *Siluridae*. A peculiar stinging sensation attends a wound by a spine of a W., which extends far up the arm, if the wound has merely been in a finger, and is much more severe than

the pain of a wasp sting. There is also a groove in the spine, which has perhaps something to do with the conveyance of the poison; but no poison-gland has yet been proved to exist. In France, the fishermen are required, under a penalty, to cut off the spines of weevils before selling them. Weevils are esteemed for the table.

WEEVIL (*Curculio*), a Linnæan genus of insects, now forming the tribe *Rhynchophora*, of the order *Coloptera*, and section *Tetramera*. They are remarkably characterised by the prolongation of the head into a beak or snout, at the extremity of which the mouth is placed, and from which the club-shaped antennæ spring. Some of them have straight antennæ; but the greater number have the antennæ *geniculated*, or bent forwards at the second joint. The species are very numerous, and are distributed over all parts of the world. They all feed on vegetable food, both in their larval and in their perfect state; and some of them are notable for the mischief which they do in the former state, to the young shoots, leaves, fruits, and seeds of plants. They are diurnal insects, many of them very small, but others of considerable size. They are slow, timid, and defenceless; although the long hard beak suggests to those ignorant of its real nature and of their habits an idea of danger in handling the larger species. Many of them are of very dull and uniform color; but some are amongst the most beautiful of the *Coloptera*—resplendent with the finest hues, and brilliant as gems. Such is the well-known Diamond Beetle (q. v.) of South America. The larvæ of weevils are soft, white, and footless, with very convex rings, hard heads, and horny jaws. The perfect insects are often found on leaves and in flowers of the particular kinds of plants on which they and their larvæ feed. *Rhynchites detritus*, a W. often very injurious to vineyards, constructs a nest for its larvæ by rolling up the leaf of the vine, piercing the roll as it proceeds, and depositing eggs between the folds in the inner part of the roll. The larvæ feed upon the leaf, which the parents further adapt for their use by cutting the leaf-stalk half through, so that the leaf hangs down, and by the time they are ready to change into the chrysalis state it drops off, or is blown off by the wind, when they bury themselves in the ground to wait for the return of spring. Other trees, as the pear-tree, are infested by weevils which destroy their leaves in a similar manner; the leaves of some, as of the peach, often suffer injury from weevils which devour them, like caterpillars, without rolling them up; and turnips are subject to the ravages of certain small species of W., which proceed in the same manner. Some species of W. gnaw young shoots. The shoots of fruit trees, and young grafts, are sometimes destroyed by weevils, which bore into them by means of their beak, and make a small chamber in the centre, in which an egg is deposited, being pushed into its proper place by the beak. The shoot is then cut through a little lower down, and the parent W. may be seen climbing upon it, when the operation is nearly completed, to make it fall by her weight, and returning again to her work, if it is not yet ready to fall. She lays about two eggs a day, but continues her operations for many weeks, so that much destruction is effected. The larvæ feeds on the pith of the fallen shoot, and deserts it when ready to become a chrysalis, to bury itself in the ground.—The larvæ of a large species of W. (*Calandra palmarum*) inhabits palm-trees in South America, feeding on their central part, and is eaten and esteemed as a delicacy. When roasted, it almost melts into grease; but its flavor is said to be remarkably fine. This W. is black; about an inch and a half long; its larvæ is between two and three inches long. Another species (*Calandra sacchari*) is very destructive to the sugar-cane. Its larvæ is also largely eaten in the West Indies and Guiana.—The wood of pines and firs is the food of certain kinds of Weevil so that plantations suffer severely from their ravages. Thousands of acres of pines in the Southern States of America have been destroyed by a W. (*Hyllobius pales*), not much more than a quarter of an inch in length; and some of its congeners in other countries are scarcely less destructive, as *Hyllobius abietis* in Europe.—There are many species of W. which attack leaf-buds and flower-buds. Thus *Anthonomus pomorum* infests the apple-tree, depositing its eggs in the flower-buds, and cutting off the prospect of fruit. *Anthonomus pyri* is equally injurious to the buds of pear-trees. Some species of *Rhynchites* lay their eggs in fruits—as apples and plums—at an early stage of their growth, cutting the fruit-stalk, so that the fruit may fall to the ground. The European Nut-W. (*Balaninus nucum*) lays its eggs in young hazel-nuts, upon which

the larvae feed as the nuts grow; a nearly allied species attacks, in like manner, the hazel-nuts of America, and another infests acorns. The *Pea-W.* (q. v.) feeds upon peas; and other leguminous plants have their peculiar species, which devour their seeds. The *Corn-W.* (q. v.) is very destructive to wheat, and other similar species to maize, rice, and other kinds of grain.

WEFT, or **WOOF**, the thread which, in weaving, is passed by the shuttle backwards and forwards through the ward. See **WEAVING**.

WEIGHING-MACHINES are of various forms, according to the quantity and species of the goods whose weight is to be determined. The great majority of weighing-machines are founded upon the principle of the *Lever* (q. v.), the chief exception being the various forms of the *Spring-balance* (q. v.), to which might be added (though in such cases the term "machine" is quite inapplicable) some of the methods employed to determine specific gravity, time of oscillation, &c. The simplest and primitive form of weighing-machine is the *Balance* (q. v.) with equal arms, which can be adapted either to the maximum of accurate weighing or to the most rapid equiponderance. But as this machine necessitates the placing in one scale of weights equal to the weight of the goods, it was soon found to be more convenient to employ a lever with unequal arms—the goods to be placed in the scale attached to the short arm, and therefore equipoised by less weights, the ratio of the weights in the two scales being in proportion to the ratio of length of the arms. On this principle the *steelyard* (see **BALANCE**), the *bent lever balance* (see **BALANCE**) and the *cart-steelyard* are constructed. But the convenience of equipoising a greater weight by one much less is counterbalanced by a considerable diminution in accuracy—one of the causes of error being the greater liability to flexure of the longer arm of the lever; and another, the necessity, for convenience' sake, of having the arm which is affected by the goods to be weighed as short as possible—the latter of itself reducing the accuracy of the steelyard to that of a symmetrical balance whose arms are each equal to the short arm of the steelyard. However, on behalf of the steelyard, there is again the advantage of rapid equipoise. Each of these machines is variously constructed, the modifications having reference either to convenience of use, or to the species or weight of the goods to be weighed.

WEIGHTS AND MEASURES. For the proper carrying on of mercantile transactions, and for many other purposes, it is necessary that there be fixed and readily-accessible standards of magnitude, of weight, and of value. The lengths implied by the names *a foot, a hand, a cubit, a fathom*, are far too indefinite to have long continued to satisfy the wants of civilised nations; and in every country, by common consent, or by the action of government, determinate measures have been agreed upon. These measures, left almost to chance, have been different from one nation to another, even from county to county, sometimes from town to town, and still more awkwardly, often from one trade or guild to another.

Any one can appreciate the inconvenience of such a want of uniformity, for, in every transaction extending beyond his own sphere, he has to take account of the change of measure, the change of weight, the change of money, perhaps of all three at once. We all see and allow that there ought to be only one system of weights and measures in one country; that one bushel in Winchester, another in York—one acre in England, another in Scotland, and a third in Ireland; that Troy weights, avoirdupois weights, and all the other local, conventional, and trade variations which abound in the British dominions, form an aggregate of unbearable confusion, leading to endless mistakes and ceaseless quarrels. It is not more difficult to extend our observation, and perceive that if one system be advisable for one country, a universal cosmopolitan system would be no less advantageous for the whole world.

The only practicable method of establishing a system of measures is to construct standards of reference, and to preserve these carefully in some public place. In order that these standards may not be worn and injured by too frequent use, it is convenient to have authenticated copies deposited in the various towns, so that all dealers and artificers may have ready access to them, and so that all makers of weights and measures may be without excuse for errors in their workmanship.

To set up a standard of measure seems to be a very simple matter—the authorities have only to fix upon the proper length of a yard, to have a piece of wood or of metal made to that length, and to cause it to be properly marked and preserved.

For common purposes, this seems to be quite enough: however, experience soon shows the inconvenience of this simple plan, for, by repeated contacts, the ends of the yard-measure get worn. Instead, therefore, of making a rod just a yard long, they make it a little longer, and upon it form two fine marks a yard distant from each other, and hold this distance to be the true standard. By this expedient, the effects of wearing are got rid of; copy after copy can be compared with the original, without deterioration of the standard.

But use is not the only cause of deterioration: wood decays or is worm-eaten, and metals are liable to oxidation, so that the material has to be carefully chosen. This is not all. Every substance which has been examined is found to change its size with a change of temperature; the standard bar is shorter in winter than in summer; and the change though it be so small as to be of no moment to the haberdasher, the Wright, or the mason, is enough to cause great trouble to those engaged in very accurate work. Hence in the selection of the substance to be used for the standard bar, we must have an eye to smallness of expansion as well as to durability. The substances available, taken in the order of their expansibility, are—*deal, glass, platinum, gold, silver, iron, brass, copper*. Deal may be put aside as wanting in durability, and the choice may be said to lie between glass and platinum, neither of which is much acted on by the air, or by the vapours which are found in the atmospheres of large towns. The fragility of glass and the costliness of platinum are objections; but the latter is a mere trifle when a national standard is concerned. Platinum, then seems to be the best substance.

The standard measure for the British Empire is a brass rod, into which two pins of gold are inserted; these are dressed flat with the surface of the bar, and a small dot is made in the middle of each. The distance between the centres of these dots, taken when the temperature is at 63° F., is declared to be the true yard.

In the same way as the standard of measure, so must the standard of weight be established. A piece of heavy metal is made of the desired weight, and is duly authenticated. The preservation of the standard of weight is a matter of very considerable difficulty. Every occasion on which it is used, each removal of dust from its surface, the actions of the oxygen of the air and of the products of combustion which are always floating about, produce a sure though slow waste; and all that can be done is to retard this waste as much as possible. Perhaps a lump of platinum would make the best standard; but its softness is a decided objection.

In the use of a standard of weight, another matter has to be taken into consideration. The apparent weight of any substance is less than its true weight by the weight of as much air as is displaced by it. Now, the density of the air is not constant—air, when warmed, expands very much more than any solid body; and therefore a piece of metal appears to weigh more in warm than in cold weather. Not only so, air is rendered more dense by an increase of pressure, and so, when the barometer is high, all heavy bodies become apparently lighter; when the barometer sinks, they appear to become heavier. Thus the apparent weight of the standard pound is continually changing. If we accurately adjust two weights of brass when the barometer is low and the air warm, and afterwards compare them when the barometer is high and the weather cold, we can perceive no change, for, though each has lost weight, they have lost alike. But if we had adjusted a weight of iron to a weight of platinum in light air, and again compared them in dense air, the change would have been at once seen. For, since a pound of iron is more bulky than a pound of platinum, it displaces more air, and its apparent weight undergoes a greater change than does that of the platinum. Fortunately these changes are too small to have any perceptible influence on mercantile transactions, yet they are sufficient to create the necessity for it being enacted that the standard weight must be held as true when the air is in a specified state as to warmth and pressure. The standard brass pound, which serves for the British Empire, is directed to be used when Fahrenheit's thermometer is at 62°, and when the barometer is at 30 inches.

The thought naturally arises, what if, in the course of time, the original standards be lost or destroyed?

Time was when a seed of wheat gathered from a well-ripened ear served sufficiently well to define a grain weight; and even now the Eastern jewellers weigh their gems against the *carat* or carob-bean, the hardness and uniformity of which

seem to justify the selection of it. But for the extended purposes of modern commerce, and particularly for the more delicate requirements of scientific research, it is indispensable that we find some unchanging object of comparison; and none can be preferred to the earth itself, as the most universally acceptable and as the best defined. For the purposes of geographers and navigators, the circumference of the earth is divided into degrees and minutes, the length of one minute being the geographical or nautical mile; and it certainly would have been convenient if the common or statute mile had agreed with this. The dimensions of the earth are now known with a precision far greater than is needed for ordinary purposes; the entire length of the circumference of a meridian circle being 131,236,000 of our standard feet, so that the length of a nautical mile is 6075 feet and about 9 inches; and it is highly probable that subsequent and more accurate measurements will not alter this determination more than an inch or two either way. It is usual to divide the minute into 60 seconds, so that a second of the earth's circumference is 101·25, and thus if our standard foot had happened to be one-eightieth part longer than it is, there would have been exactly 100 feet in a second, and 6000 feet in a nautical mile. When we reflect on the disparity of the foot used by different nations, and recollect that 100 Vienna feet make 103·6 English, as many Amsterdam feet 92·7, as many Berlin feet 99·2, we can hardly help regretting that our forefathers had not happened to hit upon the exact 100.

The ancient Greeks were fond of dividing into sixties; this division still continues in our scales for angles and for time; and it is worthy of remark, that if we divide the whole circumference of the earth into 60 parts, each of these into 60, and again each into 60, we arrive at a distance of 607·5 English feet. Now, the length of the ancient Greek stadium or furlong is stated to be 606½ feet by some writers; and if deduced from measures of the Roman mile, is between 605 and 613 feet; so that if we desire a cosmopolitan standard, we can hardly do better than go back to the ancient Greek *stadium* or the Chinese *li*, corrected to suit the more accurate determination of modern times; this would bring us to the geographical foot, one-hundredth part of a second of the earth's meridian.

The standard of weight is readily connected with the standard of measure. Some substance which can be easily obtained pure is chosen, and a definite bulk of it is weighed. Distilled water is universally selected for this purpose; and in the British system, the weight of one cubic inch of pure water is declared to be 252·458 grains when it is at the temperature of 62° F.

It has long been known that water does not continue to contract as it is cooled; the contraction becomes less and less as the temperature approaches to 41° or 39° F.; and the water, when cooled more, begins to expand, and continues to grow more bulky until it be on the point of freezing. On this account it has been proposed, and without any doubt it would be the best plan, to take water when at its greatest density as the standard for comparison, because then an error of a degree in temperature will produce no perceptible error in the weight.

The operation of verifying the standard of measure by comparing it with the size of the earth is necessarily an expensive and a complicated one, only to be attempted under the auspices of a wealthy government, or with the concurrence of several nations; and it is desirable to find out something more local and more easily obtained wherewith to compare our measures. The length of the Pendulum (q. v.) has been proposed; and, on account of a very simple and beautiful property of pendulums, the comparison can be readily made. If we imagine an excessively minute heavy body to be suspended by a thread so fine that the weight of the thread may be neglected, the compound so formed is called a simple pendulum; and the question becomes, what must be the length of such a pendulum in order that it may vibrate from side to side in, say, one second of time. Now, it is clear that we cannot obtain this length by direct experiment, since we cannot construct such a pendulum. M. Biot tried to approximate to it by using a small ball of platinum hung by a very fine wire. However it is known that if a heavy rigid mass, AB, be suspended by a knife-edge C, and if its vibrations be made in the same time with those of a simple pendulum of which the length is CD, then if we place another knife-edge at D, and reverse the ends A, B, the compound pendulum will again vibrate in the same time as before. Hence, we have a very simple method of comparison. Having con-

structed a strong bar with two knife-edges at a known distance from each other, say at the distance of a yard; let us then by many trials, filings, and scrapings, so adjust it as that the times of vibration shall be alike for the two knife-edges and, finally, let us count how many vibrations such a pendulum makes per day, and then we shall have a means of verifying our measure.



The act of parliament which fixes our present weights and measures, enacts that the length of a pendulum vibrating in one second of mean solar time is 39.13929 inches: now the lengths of pendulums are proportional not to the times in which they vibrate, but to the squares of those times; and so if we know the length of one pendulum, and the number of vibrations it makes per day, we can calculate what ought to be the length of another to vibrate a given number of times. A convertible pendulum having the distance between its knife-edges exactly 36 inches, ought to make 90088.42 vibrations per day.

When only a degree of accuracy sufficient for commercial and ordinary purposes is aimed at, the above process is by no means difficult; but when extreme precision is wanted, the operation is attended with many and very great difficulties; it involves considerations which would hardly have been expected. In the first place, our experiments are made in air, and the buoyancy of the air lessens the actual weight of the pendulum; that buoyancy has to be allowed for, and therefore it is declared that the above length is that of a pendulum vibrating in a vacuum. Next, since the earth has a diurnal motion on its axis, every substance placed on it has a centrifugal tendency which goes to modify what otherwise would have been its gravitation; this centrifugal tendency produces the earth's oblateness, and causes a variation in the intensity of gravitation from one latitude to another. A stone is actually heavier in Edinburgh than it is in Loudon. This change in gravitation cannot be measured by a balance, because the weights at each end of the balance are changed alike; but it is seen at once in the going of a clock; for a pendulum regulated to go truly in Loudon is found to go too fast when taken to a higher latitude, and to loose time when carried nearer to the equator. Hence, the enactment that the pendulum must be swung in the latitude of Loudon. And again, the attraction which the earth exerts upon bodies placed near it diminishes with their distances, being inversely as the squares of the distances; hence, a clock carried from the bottom to the top of a hill loses time perceptibly, and so it is necessary to have the additional enactment that the pendulum be swung at the level of the sea.

In addition to these niceties, there are others connected with the manipulation, such as the parallelism of the knife-edges, their bluntness, the extent of the area of oscillation, and the stability of the supports, so that altogether the exact measurement of the length of the seconds pendulum is a matter of very great complexity. All these difficulties and troubles notwithstanding, we may hold that for all practical purposes, our system of weights and measures—and it may be added, the systems of all other civilised nations—is perfectly well established, whether it be regarded as derived from the dimensions of the earth, or from the intensity of gravitation.

No system of measures can ever claim to be of universal application from which geographical dimensions are excluded. It is essential that the unit of measure bear some simple relation to the earth's circumference, for otherwise the operations of the surveyor will not accord with those of the geographer. The only question, therefore, in regard to the establishment of a cosmopolitan system, is as to the number of parts into which the earth's circumference is to be divided. Now, the denary system of numeration has already asserted its supremacy; one by one the schemes followed by different nations have given way to it, and their very languages have been modified by its influence; sufficient traces remain to show how extensive these modifications must have been. The *three-score and ten* is not yet forgotten in English, nor the *quatre-vingt dix neuf* in French. In many trades the counting is still in dozens and grosses; yet our merchants count their interest, their discount,

and their dividends in cents. The surveyor divides the foot on his levelling staff into tenths, hundredths, and thousandths; he makes his Gunter-chain of 100 links. The astronomer no longer divides the second into sixty thirds, but into hundredths; he gives his equinoctial time in decimal fractions of the day, and he makes the arguments for the planetary disturbances in thousandth parts of the whole revolution. There is no single instance in which the decimal system, once adopted, has been abandoned; slowly, but surely, its influence will increase until it will have displaced every other system. See DECIMAL SYSTEM.

No one opposes the abstract principle that one system for the whole world would be best; but each nation retains an excusable partiality for its own measures. We can never do away with our good old English penny; what I shall we give up our time-honoured standard yard, and adopt the new-fangled French *mètre*? Admit the force of such short-sighted arguments as these for ourselves, and we must admit them for all other nations, we must remain where we are. The very idea of a cosmopolitan system carries with it that of national abnegation; and of this the French set a noble example; they put aside their ancient *toise*, their *lieu*, their *pied*, and their *pouce*, to adopt a measure which commends itself to all nations alike by its want of nationality, and which consequently has been already adopted by almost every European country, and several American states.

WEIGHTS AND MEASURES have, since 1824, been in great measure regulated by statute. The statute 5 Geo. IV. c. 74 was passed to enforce uniformity in the weights and measures used in various parts of Great Britain and Ireland; and a standard yard was defined as being then in custody of the clerk of the House of Commons, and it was enacted that all superficial measures should be computed and ascertained by the said standard yard. The act also described how, if the said standard yard were to be lost or destroyed, another was to be made. So the statute defined a standard brass weight of one pound troy, and a standard gallon. That statute was altered by a subsequent statute of 5 and 6 Will. IV. c. 63, and inspectors were authorised to be appointed by justices of the peace, who had power to examine and stamp weights and measures. It was enacted that any contract, bargain, or sale made by any weights or measures unauthorised by the act should be wholly void, and every such weight might be seized by the inspector, and forfeited. One or two exceptions were made by the act—such as weights above 56 lbs.; wooden or wicker measures used in the sale of lime; glass and earthenware jugs or drinking-cups, though represented as containing the quantity of any imperial measure, or any multiple thereof, and these are not illegal, though incorrect. By a later act of 22 and 23 Vict. c. 56, inspectors have power to inspect the weights and measures of persons selling goods in streets and public places. By a statute of 29 and 30 Vict. c. 82, the custody of the imperial standards of weights and measures has been transferred to the Board of Trade; and periodical comparisons are to be made every ten years of certain standards.

WEIMAR, a small but interesting town of Germany, capital of the grand duchy of Saxe-Weimar-Eisenach, and residence of the grand duke, 60 miles south-west of Leipzig by railway. It stands in a pleasant valley on the left bank of the Ilm; but the environs are in no way remarkable, and the town itself is irregularly and rather poorly built. Though the residence of the court, and finding its subsistence in providing for the wants of distinguished visitors, W. carries on neither trade nor manufactures, and seems a dull, provincial-looking town. The lustre conferred upon W. by the residence here, at the close of the 18th and the earlier portion of the 19th centuries, of Goethe (q. v.), Schiller (q. v.), Herder (q. v.), and Wieland (q. v.) at the court of Karl-August (see SAXE-WEIMAR-EISENACH), has faded since that group was broken up by death; and now the interest of the town is almost wholly derived from its monuments, traditions, and associations. The town church (*Stadtkirche*), dating from the year 1400, has an altar-piece by Cranach, and contains a number of memorable tombs, among which are those of the brilliant soldier, Bernhard of Weimar (q. v.) and of Herder, the philosopher and critic. The ducal palace is a handsome building, some of the apartments of which are decorated by frescoes illustrating the works of Goethe, Schiller, Herder, and Wieland. The public library contains busts of these men of genius; and a number of relics, as the gown worn by Luther when a monk, and Gustavus Adolphus's leather belt, pierced by

the bullet that caused his death at Lützen. The houses of Goethe, Schiller, and Herder are still pointed out. The two former of these poets lie interned in the grand-ducal burial-vault. The park and gardens of the palace, within which is the summer residence of Goethe, are much esteemed as a promenade. Pop. (1871) 15,998.

WEIR, or **Weir**—called also a dam, and in the north of England and south of Scotland, a cauld—a structure placed across a river or stream, for the purpose either of diverting the water into a mill-lade, of raising the level of the surface of the river, and thereby increasing its depth for the purpose of navigation, or of providing the means of catching salmon and other fish. There is also the waste-weir, for the purpose of preventing a reservoir embankment being overtopped by floods; and the gauge-weir, for the purpose of computing the quantity of water flowing over it, from a measurement of the difference of level between the crest of the weir and the surface of the still water above it. The word is also sometimes used, though perhaps not quite correctly, to denote a training-wall or other structure parallel with the general line of a river, for the purpose of remedying or preventing loops or sinuosities. A weir may—according to the purpose for which it is intended, to the nature of the materials at command, or to other circumstances—be formed either of stone, timber, or brush-wood, or a combination of any two. It is generally placed obliquely across the stream, in order to make the length of its crest considerably greater than the width of the channel, and thereby prevent the water in floods from rising to so great a height as it would do with a shorter crest, to the risk of damaging the adjoining low lands, and probably putting the mills above in backwater. In such cases, the mill intake, or the navigation lock, as the case may be, is generally placed at the down-stream end of the weir. Much obliquity, however, makes the current to impinge against and to cut into the side of the river opposite the lower face of the weir, and to prevent that effect, weirs are sometimes made of the shape of two sides of a triangle, or rather of that of a hyperbola, with its apex pointing up stream, which arrangement is peculiarly applicable to the case of there being an intake for a mill on each side of the river, and the apex is a very suitable place for a fish-pass or ladder. Not unfrequently, when at a wide part of the river, the weir is placed at right angles across, and with a slight curve upwards; and a natural shelf of rock is often very advantageously made use of for either a mill or fishing weir, the low parts being made up where necessary with stone or timber.

The down-stream face of a weir is generally a pretty flat slope of stone "pitched" or set on edge, and with its top, or lower edge, either sunk into rock, or protected from being underwashed by a row of timber-sheeting piles, and frequently also by an apron of timber-planking. This slope is either straight, or made with a hollow curve so as to check the tendency of the water to acquire increasing velocity as it descends; and it is frequently divided into panels by timber-framing, so as, in the event of a portion of the pitching being washed out, to lessen the risk of the whole of it being carried away. The up-stream face is generally a slope dipping into the water, and protected by stone pitching, but it is sometimes a perpendicular wall. In order to render an ordinary sloping weir water-tight, sometimes there is under the crest or coping a row of well-jointed and close-driven timber sheeting-piles; but those being liable to decay, without their decay being visible, a better, though a more difficult and expensive arrangement, is to build a perpendicular wall of water-tight masonry under the crest. In either case, generally there is the additional precaution taken of having a wall of pounded clay on the up-stream side of the wooden or stone barrier; and sometimes a mere wall of pounded clay alone, in the centre of the wall, is trusted to, as the sole means of making it water-tight; but the latter is not a satisfactory arrangement, unless the stone-work next to the clay be so closely compacted by an admixture of gravel and sand as to prevent any current of water from reaching the clay, and cutting into it. The down-stream face is sometimes made a nearly perpendicular wall, which, unless for the obstacle which it presents to the ascent of the salmon, is a very good arrangement, where the bottom of the channel is solid rock, so as not to be liable to be scooped out by the falling water; else it must have at its foot a level apron of heavy masonry for the water to fall on. The down-stream face is also sometimes made of a series of steps, so forming a succession of levels and light falls, which is a very good plan

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for breaking the force of the falling water; but it, like the perpendicular face, presents obstacles to the ascent of the salmon, unless a fish-pass or ladder be provided.

The weir for the purpose of navigation need not be in any way different from the mill-weir, otherwise than that, instead of an intake sluice, there must be a Lock (q. v.) with upper and lower gates, and a chamber between them as long and as wide as the largest vessels navigating the river. Fishing-weirs are generally provided with a sort of cage called in Scotland a *cruiue*, a word which has been made English by having been used in English fishing-acts. The *cruiue* consists of a chamber generally about four or five feet in width, and as much or a little more in length, having at the upper end a portcullis grating, called the *heck*, with the bars vertical, and three inches apart so as to let small fish get through, and at the lower end two folding horizontally sparred doors called the *incales*, pointing upwards, but set so as to leave a small opening between the points, through which the ascending salmon enter. Partly from the inward pointing of the *incales*, and partly from the instinct of the fish to ascend the river, they seldom get out again, and are easily caught. Frequently, weirs serve the purpose both of mill-dams and of fishing-weirs.

A weir sometimes made use of for catching salmon and other fish in tidal rivers, consists of a sort of horse-shoe shaped structure of loose stone-work, through which the water can percolate freely, with its heel or open end pointing up-stream. The fish ascend the river with the flood-tide, and falling back with the ebb, partly get embayed within the walls at low water, and are either left dry, or are shut in so as to be easily caught.

Weirs, either of stone or of wicker work, are also sometimes made use of as an accessory to what in English fishing-rivers are called *putts* and *putchers*, being a sort of combination of wooden gratings acting something like those of the *cruiue* and net work; and in many cases, weirs, either natural, as formed by rocks or islands, or strictly artificial, are used for catching fish by means of an attached poke-net extended by the current.

By the English common law, no fishing mill-dam or fishing-weir is legal except it be ancient, and even an ancient fishing-weir must have a free gap, and every fishing mill-dam must have a proper fish-pass.

The following are provisions as to weirs in the English Salmon Fishery Act, 1861: For the purpose of clearly indicating the rights of mill-owners, &c., in the first place, the expression "dam" is defined to mean all weirs and other fixed obstructions used for damming up water: "fishing weir," a dam used for the exclusive purpose of facilitating the catching of fish; and "fishing mill-dam," a dam used partly for facilitating the catching of fish, and partly for supplying water for milling, &c. (24 and 25 Vict. c. 109, s. 4).

The following regulations are to be observed with respect to dams: No dam, except such fishing weirs and fishing mill-dams as were lawfully in use on the 6th August, 1861, by grant, charter, or immemorial usage, must be used for facilitating the catching of salmon. Any proprietor of a fishery, with the consent of the Home Office, may attach to every dam which existed on the 6th of August 1861, such a fish-pass as the Home Office may approve, so that no injury be done to the milling power, or to the supply of water to or of any navigable river, canal or other inland navigation. Every person who, in waters where salmon are found, constructs a new dam, or raises or alters, so as to create increased obstruction to fish, a dam already constructed, must attach and maintain in an efficient state such a fish-pass as may be determined by the Home Office. By the Tweed Act, mill-dams, weirs, cauda, and other permanent obstructions are to be so constructed as to permit the free run of salmon in the ordinary state of the river. In Ireland, as in England, weirs are legal, if they can be traced back to statute 25 Edward III. Special Fishery Commissioners have power to inquire into the legality of all fishing weirs, and every fishing weir must have a free gap.

By the old Scotch law, a provision as to mill-dams is given in the Act 1696, as follows: "In respect that the salmon fishing within the kingdom is much prejudiced by the height of mill-dams that are carried through the rivers where salmon are taken, his Majesty, with consent of the Estates of parliament, orders a constant slope in the mid-stream of each mill-dam dyke; and if the dyke be settled in sev-

eral grains of the river, that there be a slope in each grain (except in such rivers where cruives are settled), and that the said slope be as big as conveniently can be allowed, providing always the said slope prejudice not the going of the mills situate upon any such rivers." Cruives are by various old acts declared to be illegal in *tidal* waters, except the cruives and yalrs of the Solway, which is exempted as being a Border river.

By the Scotch Fishery Act of 1862, the commissioners are empowered "to make general regulations with respect to the construction and alterations of mill-dams, or lades, or water-wheels, so as to allow a reasonable means for the passage of salmon;" and they made a by-law, which has been sanctioned by the Home Secretary, providing that every dam should have a salmon pass or ladder, and also making provision for hecks at the intakes and lower ends of mill-lades, and immediately above the wheels, and regulations whereby the water, when not used for the mills, should be sent down the natural channel of the river. The commissioners are also required to make, and have made, general regulations as to the construction and use of cruives, which implies their legality, but only where there is a prescriptive right.

WEISSENFELS, a town of Prussia, in the government of Merseburg, and 19 miles south of the town of that name, on the Saale. Pop. (1871) 15,448, employed in the porcelain-factory and in wool-spinning, shoemaking, the manufacture of pianofortes, tanning, and a trade in timber. The castle, once the residence of the dukes of W., is now a barrack.

WELCKER, Friedrich Gottlieb, one of the most distinguished scholars of Germany, was born in the year 1784 at Gröben, in Hesse-Darmstadt; studied at Giessen; was appointed one of the masters of the Gymnasium there in 1808; and in the year 1806 travelled to Rome, where he remained two years. Here he became acquainted with the celebrated Danish archæologist, Zoega, whose *Life and Essays* he afterwards published, and by whose example he was stimulated to that subtle appreciation of the works of ancient art which appears everywhere in his works. On his return from Italy, he was appointed to a professorship of Ancient Literature, first in Giessen, then in Göttingen, and finally (1819) in the newly erected Prussian university of Bonn, which continued to be the scene of his scholarly activity till his death in 1868.

W. belonged to that class of scholars who, since Heyne and Wolf, have given such a lofty inspiration, such a philosophical significance, and such a historical comprehensiveness to those studies which, for want of a better name, we are forced still to designate philology. But philology in this country generally means the history and philosophy of language; with the Germans, as it did originally with the Alexandrian Greeks, it means the sympathetic understanding and the imaginative reconstruction of the life and thought of famous ancient peoples, based on the critical treatment of ancient documents, or the tasteful appreciation of the monuments of ancient art. It is needless to say that this "philology" is a very different thing from the minute verbal and metrical preciseness which was long the leading characteristic of scholarship in this country. For however important these minutiae may be in their place, they are manifestly valuable only as means to an end; and even when the end has been steadily kept in view, it cannot be denied that some of our greatest intellects have spent more of their strength on these subsidiary matters than their importance deserves. In W., Otfried Müller, and other German scholars of the first class, we see a general reaction against this narrow school; and a reaction which was sure to prosper, as it was based on thorough academic training, and had learned to neglect no trifle and to despise no minute point which could be made subservient to higher purposes. If it was the fault of German scholarship generally that it was too professional and too academic, it is the praise of Müller, W., and the school to which they belong, that they have bridged over the gulf which separates learning from life, and inspired the dry bones of tradition with a spirit which makes them intelligible to the present, and significant of the future. The long academic career of W. was distinguished by an uninterrupted course of scholarly activity. Many of his works are tracts and essays on archaeological subjects without external unity, but all exhibiting a remarkable combination of extensive and accurate learning, fine taste, delicate sensibility, and sound judgment. We can

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only note here his three most important works of a larger compass. The first is the "*Æschylean Trilogy*" (1834), in which the organic connection and sequence of the Greek dramas are set forth with a richness of constructive detail not altogether free from that fanciful and problematic element which is one of the most distinguishing characteristics of German scholarship. The second is the "*Epic Cycle*" (1835—1849), a work which has done great service to the right appreciation of early Greek literature, by taking Homer out of that region of mysterious isolation in which he had been previously allowed to remain. The third, and perhaps his greatest work is the "*Götterlehre*," or Greek Mythology (1857—1862), which embraces all that is good, and rejects all that is bad in the wide German literature of this subject, with a delicate tact and a just discrimination as valuable as they are rare. Of all W.'s works, this is the one that would most probably bear with credit the ordeal of an English translation.

WELD, or WOOD, also called DYER'S ROCKET, DYER'S WEED, and YELLOW WEED (*Rhus Luteola*), is a plant of the same genus with MIGNONETTE (q. v.), a native of waste places in England, very common in Germany and in many parts of Europe. It has an upright stem, 2—3 feet high; lanceolate, undivided leaves; and long racemes of small yellow flowers, with 4-partite calyx and prominent stamens. It is used for dyeing. In order that it may yield a good dye, it requires to be cultivated with care. The best is grown in France, England, and Holland; and that produced about Cette, in France, is preferred to all other. Good W. must have flowers of a beautiful yellow or greenish color, and abound in leaves; that which is small, thin-stemmed, and yellow, is better than that which is large, thick-stemmed, and green; that which grows on dry sandy soils is better than that produced on rich and moist soils. It was formerly cultivated to a much greater extent in Britain than it is at present, and was also more used by dyers than it now is. W. is still, however, a valuable dye-stuff. It serves equally for linen, woollen, and silk, dyeing not only a rich yellow, but, with proper management, all shades of yellow, and producing a bright and beautiful color. Stuffs previously dyed blue are, by means of W., changed to a very pleasing green. Large quantities of W. are imported from France.

WE'LDING, the process by which some substances are united together in a softened state. It is generally applied to such metals as malleable iron, two pieces of which, heated to redness, may be made to unite by applying them together and beating with a hammer. Other substances, such as horn and tortoise-shell, can be welded by first making separate pieces soft by heat, and pressing them together, which causes so intimate a union that no traces of the junction remain after cooling.

WELLESLEY, Richard Colley Wellesley, Marquis, K.G., English statesman, was born at the town residence of his family, Grafton street, Dublin, June 30, 1760. The family of Wellesley was of Saxon origin, belonging to the county of Sussex, and was among the most ancient in Ireland, one of them having gone from England as standard-bearer to Henry II., who gave him large grants of land in Meath and Kildare. William de Wellesley was, in 1334, summoned to parliament as Baron Noragh, and was high in favor with Edwards II. and III. The name (originally *Wellesley* or *Wesley*) was written Wellesley till the 16th c., when it became abbreviated into Wesley. Mr. Garrett Wesley of Dangan, county Meath, married Miss Colley, of Castle Carbery; and on the decease of his son without issue, the estates were bequeathed to his cousin, Richard Colley, who thereupon assumed the name of Wesley. The Colleys, originally Cowleys, were also of ancient descent, and came originally from Rutlandshire. Richard Colley, who thus succeeded to the Wellesley estates, though in no way related by blood to the earlier Wellesley family, was created Baron Mornington. His eldest son received (1760) the dignities of Viscount Wellesley and Earl of Mornington, and enjoyed the still more enviable distinction of being the father of the Marquis Wellesley, the subject of this notice, and of Arthur, first Duke of Wellington, by his marriage with the eldest daughter of Arthur, first Viscount Dungannon. W.'s father, the first Earl of Mornington, although chiefly known for his talents as a musical composer, was a man of great abilities. W. received his education at Eton, and afterwards at Christchurch, Oxford, at both seats of learning his fame stood high. An eloquent speech was made by him at Eton as early as 1778; and in 1780, he gained the University prize for the best com-

position in Latin verse, in which he excelled through life. His father having died in 1781, W., on attaining his majority, took his seat in the Irish House of Peers, took upon himself the pecuniary obligations of his father, and placed the estates under the management of his mother, who survived her husband for nearly half a century. The debts of the first earl were liquidated, but W. was unable to preserve the family possessions. He was one of the original Knights of St Patrick when the order was founded by George III. in 1783. It appears, from a correspondence between Pitt and the Duke of Rutland, that at the age of 24 he had convinced both statesmen that he was destined to distinguish himself, and to render the public essential service. Dissatisfied with the limited field of distinction which Ireland afforded him, he obtained, in 1784, a seat in the British House of Commons as member for Beersaleton. In 1786, he became one of the Lords of the Treasury, when he was elected for Saltash. Being unsuited on petition, he obtained a seat for Windsor, and became a favorite of George III. Accident directed his attention to India, and in 1793, he became one of the unpaid members of the Board of Control. In October 1797, he received a seat in the House of Lords as Baron W.; and, at a most eventful period, was selected to go to India as governor-general. Four powers then divided the sovereignty of India—the British; Tippoo Sahib; the Nizam; and the Marhattas, comprehending Scindiah, Holkar, and the Rajah of Berar; and the west of India was the scene of invasion by Zemaun Shah. Tippoo hated the English, and meditated their expulsion from India; and the troops in the service of the Nizam and the Marhattas were officered by Frenchmen. When W. arrived at Calcutta, in May 1798, Egypt had been conquered by Bonaparte; and the native powers of India, incited by the French, were unfriendly to British rule. His first operation was one of great boldness. Disregarding the remonstrances of the Madras Council, he ordered the Nizam to disband 14,000 men, surrounded them with a British force, secured the 124 Frenchmen by whom they were officered, and sent them instantly to Europe. Having annihilated French influence, he began the reduction of the empire of Mysore. On the 3d February 1799, he ordered General (afterwards Lord) Harris to march with an army of 20,000 men direct from the coast upon the Mysore capital. He himself removed to Madras to be near the scene of this eventful operation. In one short month the fortress of Seringapatam was taken, Tippoo Sahib slain, and his dominions partitioned. Having thus, in fifteen months, destroyed French influence, struck terror into the native princes, and overthrown the most inveterate enemy of British rule in India, he returned to Bengal. Up to this period he had been the Earl of Mornington; he was now (Dec. 1799) created by the king Marquis of W.; and received the thanks of parliament. The East India Company offered him £100,000 of the prize money realized at Seringapatam, but he refused, disdaining to be enriched out of military spoil. He afterwards accepted an annuity of \$5000 voted him by the Court of Proprietors. His next step was to place the territories of the Nabob of the Carnatic under the administration of the company, in consequence of the treachery of that prince. He also concluded a treaty with Persia, to which he attributed "the fall of Zemaun Shah, the confusion of the Afghan government, and the repression of the annual project of invading Hindostan from Cabul"—then, as since, the nightmare of all Indian statesmen. In the year 1801, he sent a force of 7000 men up the Red Sea, to assist in wresting Egypt from the French. The expedition, under General Bair, reached Egypt, and effected a junction with the army from England; but the French had already surrendered. In 1802, in consequence of differences with the Court of Directors, he tendered his resignation; but was induced to continue in office until January 1806. The Marhatta war broke out; the battles of Laswaree, Assaye, Argaum, and Delhi were fought; and Scindiah, the Berar Rajah, and Holkar were stripped of their dangerous influence, and reduced to submission. A large accession of territory rewarded the gallantry of the army; and in 1805, W. returned to England, after the most brilliant administration ever known in India. He had outshone even the native princes in the pomp and splendor of his progress. He built the palace of Calcutta; founded and patronized the college for Indian literature; stimulated every attempt of natives and Europeans to bring to light the vegetable, mineral, and physical treasures of the "golden peninsula;" and inaugurated those important financial reforms which in a brief period raised the revenue of the Company from 7

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to more than 15 millions sterling. On his return, he was received with every mark of respect and approval by the directors; but as a matter of course, there were many complaints that his administration had been oppressive, especially towards the native powers; and articles of impeachment were even presented to the House of Commons, though they were rejected with contempt. He now prepared to enter anew upon a parliamentary career. George III. wished him to be one of the secretaries of state in the Portland cabinet, but he declined the offer. He then went to Spain as ambassador-extraordinary in 1809; landed at Cadiz on the day the battle of Talavera was fought, and on the 2d of November met his brother, the Duke of Wellington, at Seville. In December 1809, he was appointed Secretary of State for Foreign Affairs; and in 1810, was elected a Knight of the Garter. He was favorable, both in and out of office, to the repeal of the penal laws affecting the Roman Catholics; and when, in January 1812, the Prince Regent refused to agree to a concession of Roman Catholic claims, W. resigned his seat in the cabinet. During the first ten years of the administration of Lord Liverpool, he remained in opposition. He protested against the insufficiency of the means placed at the disposal of the Duke of Wellington, and did not cease to demand that he should be assisted to the utmost extent of the national credit and resources, until the Duke had crossed the Pyrenees at the head of his victorious army, and brought the war to an end before Toulouse. When the settlement of the affairs of Europe was being arranged in 1815, W. protested against the neglect of commercial interests, but without effect. He now began to ally himself with the more liberal section of the Conservatives, who looked up to Mr Canning as their leader, and accepted the office of Lord-lieutenant of Ireland. Conciliation was to be the principle of his government, but he held office for five years without effecting any material amelioration, owing to the difficulties arising out of the state of the penal laws. He was recalled from Ireland by his brother when he took office in 1823. In 1820, W. accepted the post of Lord-steward of the Household from Earl Grey; and in 1833, in the 74th year of his age, he again proceeded to Ireland as viceroy, where he remained until Sir R. Peel's administration of 1834. In 1835, on the restoration of the Whig party, he accepted the post of Lord Chamberlain, which he only held for a few months. In 1837, it became known to the Directors of the East India Company that he was in straitened circumstances, and deriving little if any advantage from their annuity of £5000 per annum; they therefore resolved that a sum of £20,000 should be voted in trustees for his benefit. In 1841, it was further resolved that his statue should be erected in the court-room, as a mark of the admiration and gratitude of the East India Company. He died at Kingston House, Knightsbridge, on the 25th September 1842; and, in compliance with his will, was buried in the vault at Eton College Chapel. An authentic record of his Indian administration was undertaken by Mr Montgomery Martin, under the direction and at the expense of the East India Company, and published in 1836 in 5 vols. 8vo, entitled "Despatches, Minutes, and Correspondence of the Marquis Wellesley, during his Administration in India." A thin 8vo vol., issued in 1833, contains "Despatches and Correspondence of the Marquis Wellesley, during his Mission to Spain." The marquis published several pamphlets on various occasions: "Substance of a Speech in the House of Commons on the Address in 1794;" "Notes relative to the Peace concluded with the Mahrattas;" "Letters to the Government of Fort George, relative to the new form of Government established there;" "Letters to the Directors of the East India Company on the India Trade;" &c. He was twice married, but left no issue, and the marquise became extinct at his death; the earldom, &c., went to his next brother, but afterwards reverted to the second duke of Wellington, as son of the great duke, who was third brother.

WELLINGBOROUGH, so called from the medicinal springs in its vicinity, is a market-town in the county of Northampton, 10½ miles east-north-east of the town of that name. It carries on a considerable trade in corn, boots, and shoes. Pop. (1871) 9335.

WELLINGTON, a town of New Zealand, the capital of a province of the same name, and now also the capital of the whole colony, the residence of the governor, and the place of meeting of the "General Assembly," or colonial parliament. W. was the first settlement of the New Zealand Company, and was planted under the

direction of Colonel Wakefield, with a band of pioneer colonists, in 1840. The town is beautifully situated on a bay of Port Nicholson, itself an inlet of Cook's Strait, on the southern coast of the North Island. The surrounding country is richly wooded, but the dense forests have begun to yield to the axe of the settler. The harbor is a fine expanse of water, six miles long and five broad, and has an excellent wharf, affording accommodation to ships of any tonnage, and considered one of the best in the Australian colonies. Since the removal of the seat of government hither, the town has made very rapid progress; it possesses a number of good public buildings; a handsome pile has recently been erected for the use of the House of Representatives and Legislative Council. The streets are generally spacious, and have good dwelling-houses. W. possesses a cathedral, together with fourteen other places of worship, in connection with the Episcopalians, Presbyterians, Methodists, Roman Catholics, and Jews. There are also several banks and numerous insurance agencies. Two papers are published daily, and one weekly. In June 1866 a regular line of steam-packets was established between Sydney, W., and Panama. W. is also connected by steamers with all the principal ports of New Zealand. Pop. in 1874, 10,547.

WELLINGTON, Arthur Wellesley, Duke of, K.G., one of England's greatest generals, was the third son of Garrett, first Earl of Mornington, and brother of the Marquis Wellesley (q. v.). He was born May 1, 1769, at Dangan Castle, Ireland, and completed his military education, a few years before the French Revolution, in the military college of Angers, in France. He entered the army as ensign in the 41st Regiment in 1787, and became lieutenant-colonel of the 83d in 1793. In 1794, he embarked in command of the 83d Regiment, to join the Duke of York's army in the Netherlands. In this, his first term of actual service, he commanded three battalions on the retreat of the army through Holland, and distinguished himself in several repulses of the French. In 1796, he accompanied his regiment to India, where his brother, the Marquis Wellesley, shortly afterwards arrived as governor-general. He commanded the subsidiary force of the Nizam, when the reduction of the Mysore was decided upon, and his division defeated Tippoo Sultan's right flank at Mallavelly. At the assault and capture of Seringapatam, he commanded the reserve in the trenches. He was appointed to the command in Mysore, and took the field (1800) against Dhoondiah Waugh, a Mahratta freebooter, who was defeated and slain. He was named second in command of the expedition which sailed from India to assist the English army in Egypt, but was prevented from embarking by illness. It was in the Mahratta war of 1803 that the young general won his first fame. After besieging and capturing Ahmednuggur, W., with only 4500 men, came upon the combined Mahratta forces, 40,000 or 60,000 strong, and not waiting for a larger British force that was on its way, won the brilliant victory of Assaye (q. v.). The victory of Argaum followed; and the great fort of Gawalghur, supposed to be impregnable, having been taken in December, the Mahratta chiefs sued for peace, after one of the most extraordinary campaigns on record. W. was made K.C.B., and received the thanks of the king and parliament. In 1805, he returned to England, and in November commanded a brigade in Lord Cathcart's expedition to Hanover. In 1806, he obtained a seat in the House of Commons for Newport, Isle of Wight; and in April 1807, was appointed Chief-secretary to Ireland, the Duke of Richmond being Lord-lieutenant. He held a command in the army under Lord Cathcart, in the expedition against Copenhagen in 1807; and after the affair at Kluge, negotiated the capitulation of Copenhagen. He received the thanks of the House of Commons in his place, and returned to Ireland. In 1808, he commanded an expedition which sailed from Cork, being the first division of the British army sent out to assist in the expulsion of the French from Spain and Portugal. He landed at Corunna, and offered his aid to the army and people of Galicia; but the offer being declined, he finally landed (August 1808) with 10,000 troops at the mouth of the river Mondego, in Portugal. The whole of the north of Portugal was then in arms against the French. The affairs of Obidos and Roliça were quickly followed by the battle of Vimeira, in which he defeated Junot, who lost 3000 men and 18 pieces of cannon. After this event, W. signed the armistice which led to the convention of Cintra (q. v.). He subsequently gave evidence generally in favor of this Convention at the Court of Inquiry (November 22). Being superseded in the command of the army by men who were only his

superiors in military rank and seniority, he returned to England. For the battle of Vimeira, he again, in his place, received the thanks of the House of Commons. On the death of Sir John Moore, he returned to re-assume the command of the Peninsular army, previous to which he resigned the office of Chief-secretary of Ireland. He arrived at Lisbon, and assumed the command April 22, 1809. He had now to contend with Soult and Victor who had entered Portugal at the head of a veteran army, and were in possession of its finest northern provinces. Oporto had been taken by Soult, and W. was anxious to bring him to action at once, in order that he might not make his retreat unharmed. The passage, at Villa Nova, of the Douro, a wide, deep, and rapid river, in the face of a formidable enemy, who had removed every boat and barge to the opposite side of the river, was one of the boldest and most successful operations of the war. W. entered Oporto the same day, and followed the French army. He was now, by a decree of the Prince Regent of Portugal, Marshal-general of the Portuguese army. The French had fallen back to a point where reinforcements were to meet them; and on the 27th and 28th July 1809, the enemy, commanded by Victor and Sebastiani, were defeated by the British under W. at Talavera. The slaughter on both sides was terrible, in this desperate, almost hand-to-hand conflict. W. was unable to follow up his victory owing to the non-co-operation of the Spanish army under Cuesta; and the want of supplies, and the junction of Soult, Ney, and Mortier in his rear, compelled him to fall back upon Badajoz. The thanks of parliament were voted for the victory of Talavera, and Sir Arthur Wellesley was created (4th September 1809) a peer by the titles of Baron Douro of Wellesley and Viscount Wellington of Talavera, with a pension of £2000. In May 1810 the French collected, under Massena, in such superior force in his front that he fell back upon Busaco, where he made a stand. Here the French (September 27) made two attacks upon his position, but were repulsed with great slaughter. After this he retreated to Torres-Vedras (q. v.), to the occupation of which line of defence, and his judicious method of maintaining it, the ultimate success of the Peninsular war may be chiefly attributed. Massena, being unable to find subsistence for his army, began his retreat to Santarem, followed by W., who pursued the French in their retreat along the line of the Mondego. In April 1811, he received the thanks of parliament for the liberation of Portugal. Spain, however, was now subdued by the French. The Spanish armies were annihilated, and it was of the last importance that W. should be able to keep his rear open to the Tagus. W. having invested Almeida, Massena attempted to relieve it, but was skillfully repulsed at Fuentes de Onoro, May 8 and 5. The fall of Almeida followed, and W. ordered Badajoz to be invested. At this time, he had great reason to complain of the want of support and reinforcements from England. He had only the force which had followed Massena from Torres-Vedras, diminished by 9000 men, *hors de combat* in so many sanguinary encounters. Writing to Marshal Beresford, he said: "I enclose a dispatch from Lord Liverpool [then at the head of the Home Government]; I believe they have all gone mad." The siege was carried on with vigor; but learning that Soult and Marmont designed to join their armies into one, in order to relieve Badajoz, and his own inadequate force not justifying him in risking a battle, he raised the siege, and retired to the frontiers of Portugal. He next laid siege to the strong fortress of Ciudad Rodrigo; and on the night of January 19, 1812, it was carried by storm, and the garrison made prisoners. For this achievement he was created by the Regency a Grandee of Spain, with the title of Duque de Ciudad Rodrigo. He again received the thanks of parliament, and a further pension of £2000 a year, and was advanced in the British peerage by the title Earl of Wellington. He next marched towards Badajoz, invested it in March, and carried it by storm, April 6, after a frightful carnage; the allies losing nearly 6000 men. In June, he advanced to Salamanca, captured the convents there, which had been fortified by the French, and drove Marmont to the Donro. On the 22d July, he gained at Salamanca one of his greatest military triumphs. Marmont extended his line, with the view of turning W.'s right; but the latter, perceiving that the enemy had thus weakened their left and centre, vigorously assailed the weak points, and after an obstinate resistance, put the whole army to rout. Ammunition, stores, two eagles, eleven pieces of cannon, and 7000 prisoners, were the trophies of victory. The loss of the allies was only about 700 killed and 4000 wounded. Marmont lost an arm, and four French generals were killed. W. received the order of the Golden Fleece, entered Madrid, was made

generalissimo of the Spanish armies, and was advanced in the British peerage by the title of Marquis of Wellington. The thanks of parliament were again voted to him, together with the sum of £100,000, to be laid out in the purchase of lands to be settled on him, his heirs and successors. In September, he marched to Burgos, but failing to capture it, he again retreated to the frontiers of Portugal. W. visited Cadiz and Lisbon, where he was received by the whole population. In May, he marched his army into Spain in two columns, and on the 21st June gained, at Vittoria, another signal victory, over the French, commanded by King Joseph, assisted by Marshal Jourdan. The enemy lost 151 pieces of cannon and all their ammunition. The king's private carriage, letters, &c., fell into the hands of the victors. In exchange for the bâton of Jourdan, which was found on the field, the Prince Regent forwarded to W. the bâton of a field-marshal of England. By this splendid and important series of victories, he had reached the summit of martial glory. The deliverance of Spain from the French was now certain. His infantry were soldiers who would, in his own words, "go anywhere and do anything;" and even the invasion of France itself seemed to his countrymen to be no longer chimerical. He pursued the French army to France by Pamplona. He failed, July 25, to carry San Sebastian by assault, but gained another decisive battle over Soult at the Pyrenees, and the French army retreated into France. A second attempt to carry San Sebastian by assault was successful, but it cost W. 2800 in killed and wounded. He now crossed the Bidasoa, and invaded France. Pamplona surrendered. After the passage and battle of the Nivelle, and the passage of the Nive, the victorious army of W. was attacked, December 10 to 18, on the left and right, by Soult, who was defeated. Leaving two divisions to blockade Bayonne, W. followed Soult with the rest of his army. On the 27th February 1814, he defeated Soult at Orthez, and crossed the Adour. The affairs of Aire and Tarbes were followed by the passage of the Garonne; and on the 10th April, W. consummated this series of brilliant victories by again defeating Soult under the walls of Toulouse. The allied Russian and German armies having entered Paris, and Napoleon having signed his abdication a few days before, this last battle would not have been fought but for the non-arrival of news of the events of Paris. In a few weeks W. was in Paris, presenting the trophies of his brilliant campaign to the allied monarchs. He was created, May 8, Marquis of Douro, and Duke of W. in the British peerage, and received an additional grant of £400,000. He received for the twelfth time the thanks of parliament for his services, and on his arrival in England was greeted with the utmost enthusiasm. On the 28th of June, he took his seat for the first time in the House of Lords. He next returned thanks at the bar of the House of Commons, and was addressed by the Speaker. He was appointed ambassador-extraordinary to the court of France in July 1814, whence he proceeded to the congress of Vienna, Napoleon having escaped from Elba, the congress was abruptly broken up. W. was appointed commander of the British forces on the continent of Europe, and from Vienna joined the army at Brussels. It appeared probable that Napoleon would make a bold advance into Belgium, and its defence was assigned to an Anglo-allied army under W., and a Prussian army under Blücher. The battles of Ligny (q. v.) and Quatre Bras (q. v.) were succeeded on the 18th June 1815 by the great battle of Waterloo (q. v.). Here the grand and decisive blow was struck; here for the first and last time the Emperor and the great English general met and measured swords, and here the power of Napoleon was finally crushed. The allied armies under W. and Blücher, marched upon Paris; the French army evacuated Paris under a convention; and Louis XVIII. entered Paris the very day after the English army. Marshal Ney was brought to trial. He relied upon the terms of the capitulation of Paris, and appealed in vain to W., who denied that the French king was bound by the convention—a reading which it is impossible to justify, as Sir A. Alison has shewn in his "History of Europe." At the request of the allied sovereigns, W. took the command of the army of occupation, and resided in Paris from 1815 to 1818. Two attempts were, during this period, made upon his life: gunpowder was placed in his cellar for explosion; and one Cantillon discharged a pistol into his carriage; for which attempt at assassination, Napoleon I. left the miscreant a bequest in his will. When the allied armies evacuated France in 1818, the emperors of Russia and Austria, and the king of Prussia,

created W. a field-marshal of their armies. He was created Prince of Waterloo by the king of the Netherlands. The gratitude of the British nation was, meanwhile, enthusiastically manifested. Statues were raised to his honor in the metropolis. Parliament voted £200,000, in addition to former grants; and the mansion and estate of Strathfieldsaye were purchased, to be held by W. and his heirs. The office of Master-general of the Ordnance, now abolished, but then comprehending the control of the artillery branch of the service, was conferred upon him. At the coronation of George IV., in 1821, he officiated as Lord High Constable of England. In October, he attended George IV. to the field of Waterloo. In 1822, he represented Great Britain at the Congress of Verona, where he ineffectually exerted his influence to prevent the invasion of Spain by a French army, in support of absolutist principles. In 1826, he went on a special embassy to St Petersburg, when he induced the Emperor Nicholas to act in common with England and other powers, as mediators in the quarrel between Turkey and Greece. On his return, he was appointed Constable of the Tower. In 1827, he succeeded the Duke of York as commander-in-chief of the army, and was made colonel of the Grenadier Guards.

From this period, his political career may be said to begin. When Mr Canning received the commands of George IV. to form an administration, W., with six other members of the Liverpool administration (including Lord Eldon and Peel), resigned office. In the explanations which he gave, he emphatically denied that he had entertained the ambition of himself filling the post of first minister; and said he felt his incapacity for such an office so strongly that he should have been "mad" if he had coveted it. In August 1827, after Mr Canning's death, he again accepted the command of the army, which he resigned on being called upon by George IV. (January 8, 1828) to form an administration. Of strong Tory politics, he was, nevertheless, the first minister to cede to the growing popular power. The Test and Corporation Acts were repealed, and the removal of the Catholic disabilities was the first measure proposed by W. in the following session, upon the ground of the formidable attitude of the people of Ireland and the danger of civil war. This measure involved him in a bloodless duel with the Earl of Winchelsea. The French revolution of 1830 appears to have influenced him in making a firm stand against reform in parliament, in the same proportion that it raised the demands of the people; and when the struggle of Continental Europe to emancipate itself from arbitrary government, strengthened the popular cry for "parliamentary reform," he chose the earliest moment to declare the unalterable perfection of the representative system of the country, and the determination of his government to resist all measures of parliamentary reform. His unpopularity became excessive; and anticipating a defeat in the House of Commons, on Mr Brougham's proposition for reform in parliament, W. resigned office, and was succeeded by Earl Grey. He had meanwhile become Lord Warden of the Cinque Ports. Under the administration of Earl Grey, W. held no office. He strenuously opposed the Reform Bill, and a London mob broke the windows of Apsley House, and hooted and pelted him in the streets. In January 1834, he was elected Chancellor of the University of Oxford. Upon the enforced resignation of Lord Melbourne in November 1834, he was sent for by William IV. He declined to take the premiership, and was intrusted by the king with the whole charge of the government, and the seals of the three Secretaries of State, until Sir R. Peel could arrive from Rome. Peel constructed a Conservative government, in which W. took the office of Foreign Secretary. In April, Peel resigned, and henceforward W. ceased to take a prominent share in the civil government of the country. He gave a generous welcome to Soult, who represented France at the coronation of Queen Victoria, and was received with great cordiality by the people on this occasion. In August 1839, a grand banquet was given to him at Dover, as Lord Warden of the Cinque Ports, on which occasion Lord Brougham proposed his health in a brilliant eulogium. In 1841, he accepted a seat in the cabinet of Sir R. Peel, without office. In 1842, the Queen visited him at Walmer Castle, and in the same year he was reappointed to the command of the forces. In 1845, he doubted the policy of repealing the Corn Laws; but in conformity with his usual practice, of considering "how the Queen's government was to be carried on," he determined to stand by Sir R. Peel in his attempt to abolish them. W. consented not merely to remain in the cabinet, but ac-

cepted the higher office of President of the Council in lieu of the post of Lord Privy Seal. When the bill came up to the Lords, W., with great emotion and earnestness, warned the peers not to reject the bill, and never to separate themselves from both the Crown and the House of Commons. His speech made a great impression, and the bill passed a second reading by a considerable majority. He retired with the Peel government in July 1846. After this event, he may be said to have withdrawn from political strife, nor is it to be denied that his share in the repeal of the Corn Laws cast a halo of popularity around the remainder of his life. In 1848, he called attention to the unsatisfactory state of the national defences, in a letter to Sir J. Burgoyne. As commander-in-chief, he directed great preparations to be made to prevent a Chartist outbreak on the 10th April. His last speech in the House of Lords was delivered in support of the Militia Bill, when he declared that England had been carrying on war in all parts of the world with an insufficient peace establishment. On September 14, 1852, he was seized at Walmer Castle with an epileptic fit, became speechless, and died the same afternoon. His remains were honored by a public funeral. The body, after lying in state at Chelsea Hospital, was removed to the Horse Guards; and on the morning of November 18, was borne through the streets of London to St Paul's Cathedral, where it rests by the side of that of Lord Nelson. The funeral pageant was witnessed by a countless multitude. His "Despatches," published by Colonel Gurwood, in 12 vols., are the proudest monument of his glory; they exhibit him as a commander who overcame countless difficulties by honesty, sagacity, singleness and constancy of purpose, and devotion to duty. Throughout his long career, he appears the same honorable and upright man, devoted to the service of his sovereign and country, and just and considerate of those all who served under him. As a general, he was cautious, prudent, and careful of the lives of his men; but when safety lay in daring, as at the battle of Assaye (q. v.), he could be daring in the extreme. He enjoyed an iron constitution, and was not more remarkable for his personal intrepidity than for his moral courage. The union of these qualities obtained for him the appellation of the "Iron Duke," by which he was affectionately known in his later years. His parliamentary oratory was plain and to the point. He spoke without fluency or art, yet his strong sense and practical sagacious judgment gave him great weight with his brother-peers. His tastes were aristocratic; and his aides-de-camp and favorite generals were almost all men of family and high connections. Altogether, he was the very type and model of an Englishman; and in the general order issued by the Queen to the army, he was characterised as "the greatest commander whom England ever saw." He married, in 1806, the second daughter of the third Earl of Longford, and by her (who died in 1831) he left two sons—Arthur Richard, the second duke (who also inherited the earldom of Mornington), and Charles, deceased, whose son, Henry Wellesley, is heir-presumptive to the title.

Colonel Gurwood's "Despatches of the Duke of Wellington," 12 vols.; Gurwood's "General Orders of the Duke of Wellington," 1806—1818; Napier's "History of the Peninsular War;" Alison's "History of Europe;" Thibaudau's "Histoire de l'Empire;" Thiers, "Histoire de l'Empire;" Marquis of Londonderry's "Narrative of the Peninsular War," 1806—1818; Gleig's "Life of Arthur, Duke of Wellington;" Bourrienne's "Mémoires sur Napoléon;" Las Casas, "Mémoires de Ste-Hélène;" "La Vie de Wellington," by Brialmont; "Speeches in Parliament of the Duke of Wellington;" "Sir R. Peel's Memoirs," by his Literary Trustees; "Despatches, Correspondence, and Memoranda of Field-marshal Arthur, Duke of Wellington," edited by his son the Duke of Wellington, and issued in two volumes, published respectively in 1871 and 1872—uniform with Gurwood's edition; the former reaching from 1794 to 1812, and the latter from 1812 to the end of the military series. An official record of the thoughts and acts of the emperor was issued in Paris, with the sanction of Napoleon III., under the title "Correspondance de Napoléon I."

WELLINGTON, a small market-town in the county of Somerset, 7 miles south-west of Taunton, at the foot of the Blackdowns, which are crowned by a monument commemorative of the battle of Waterloo. The town gives title to the Duke of Wellington. Blankets, serges, and other woollen goods and earthenware are manufactured here. Pop. (1871) 8119.

WELLINGTON, a small market-town of Shropshire, 10 miles east of Shrews-

Wellingtonia
Welsh

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bury, at the foot of the Wrekin, on the Shrewsbury and Shropshire Canal. The town forms the junction of several railways. It is situated in a populous mining and agricultural district, with coal and iron mines, iron works, lime-stone quarries, and wire-mills in the vicinity; while, in the town, there are smelting-furnaces, nail-works, and malt-kilns. The spacious public market, with town-house and assembly room, cost about £20,000. Pop. (1871) 5928.

WELLINGTONIA, a genus of trees, of the natural order *Coniferae*, of which only one species is known, *W. gigantea*, the greatest of all pines, and indeed by far the largest tree of temperate climates. The genus is nearly allied to *Sequoia* and *Taxodium*. The foliage is very similar to that of an arbor vitae, the leaves being very small, like scales, and closely appressed to small slender branchlets. The leaves of young plants are longer and somewhat needle-shaped. The branches divide into very numerous small branchlets. The flowers are generally solitary and terminal, the male and female flowers distinct, but on the same tree. The cones of the *W. gigantea* are ovate, from 1½ to 2 inches long, by 1½ inch broad, single, or in opposite pairs, rarely clustered, the scales wedge-shaped, with about four seeds under each. The *W. gigantea* has a columnar stem, with branches only on the upper half of it, the branches of comparatively small size, and not forming an umbrageous head. The stem attains a height of 800 feet, and sometimes more, perfectly straight and erect. One tree is known, 331 feet in height; and near it lies a larger one, which has fallen, and which was broken against another large tree in its fall, its diameter where it was broken, 800 feet form its base, being 18 feet. Another tree is 103 feet in circumference at the base. The *W.* is found only in a limited district in California, on the Sierra Nevada, at an elevation of 4000 to 5000 feet above the sea. It was discovered in 1850, by Mr. Dowd, who, being engaged in deer-hunting, came with astonishment into the midst of a group of these trees, now known as the Mammoth Trees of Calaveras. In this locality, within an area of 50 acres, are 123 large trees, 20 of which exceed 25 feet in diameter at the base, and are therefore about 78 feet in circumference. A tree which was felled was 302 feet in height, and 96 feet in circumference at the ground. It was sound to the centre. Its age may be guessed at something like 3000 years. It was calculated to contain about 500,000 cubic feet of timber. Five men were employed for 23 days in felling it, by boring great auger-holes and sawing between them. When it had been cut through, it remained steadfast on its base, and more than two days were spent in driving in great wedges, to cause it to fall. A round wooden house has been erected on the stump, where dancing parties sometimes enjoy themselves. For several years, the Wellingtonias of Calaveras were supposed to be the only trees of their kind in existence, but groups have more recently been found in other parts of the same district, and scattered trees in a number of localities. The *W.* has been introduced into Britain, the climate of which is very suitable to it; fine young trees are now to be seen in many places, and plants are common in nurseries. The *W.* has been called *Washingtonia* by some American writers, but no reason, except national feeling, has been alleged for the change of the name. According to the generally acknowledged rule in natural history, the older name must be retained.

WELLS, an ancient city and municipal and parliamentary borough, in the county of Somerset, pleasantly situated at the foot of the Mendip Hills, 15 miles south-west of Bath. It is a clean and cheerful town, with runlets of water flowing through each principal street. The cathedral, a remarkably beautiful edifice, begun in 704, and enlarged in 1138, is for the most part in Early English; but its west front, one of the noblest façades in the kingdom, and which is enriched with 300 statues, is in Gothic. The bishop's palace, originally founded in 1083, is surrounded by a moat supplied from the abundant source of St Andrew's Well—from which the town is said to derive its name—and by lofty walls. There are no manufactures, and the trade is chiefly retail. Pop. (1871) 4518.

WELL-STAIRCASE, a winding staircase with an aperture in the centre, called the *well*, by which light and air are admitted.

WELSER, the name of a famous extinct patrician family in Augsburg. JULIUS W. was knighted by the Emperor Otto I. for his services in the war against the Hungarians. His son, OCTAVIAN W., settled in Augsburg, and from him descended

the patrician family, which always held important posts in the council of that town. BARTHOLOMEW W., privy councillor of the Emperor Charles V., was so wealthy, that he could vie with the Fuggers (q. v.) in munificence. With the emperor's permission, in 1538, he fitted out three ships in Spain, which, under command of Ambrose Dalfinger, of Ulm, sailed for America, and took possession of the province of Caracas, which the emperor gave W. in pledge. Twenty years after this, the Welshers gave up their possession voluntarily, and it reverted to Spain.—The most famous of the family was the niece of Bartholomew W., PHILIPPINE W., a daughter of his brother Franz W., born about 1530. She had received an excellent education from her clever mother, and was exceedingly beautiful. On the occasion of a Diet of the empire at Augsburg in 1547, she was seen by the Archduke Ferdinand, the second son of the subsequent emperor, Ferdinand I., who fell in love with her. The young girl firmly rejected all the advances of this fiery youth of 19, and refused to have any relation with him excepting by marriage. They were therefore married in 1550, without the knowledge of his father, or of his uncle, Charles V. His father, on hearing the news, was exceedingly angry, and for a long time his son did not venture to appear before him. Even in other countries, this meanness made a great noise. In the meanwhile, the loving couple enjoyed the greatest domestic happiness, and Philippine enchanted every one that knew her by her intelligence and kindness of heart. It was only after eight years that his father was reconciled. Philippine, in disguise, herself handed him a petition, and by her deportment on the occasion, as well as her beauty, disarmed the angry father. He forgave his son, declared his children legitimate, and raised their mother to be Markgravin von Burgau. This happy marriage lasted 30 years. Philippine died at Innsbruck in 1580. In the palace at Schönbrunn, the portrait of the lovely Philippine is still pointed out.

WELSH LANGUAGE AND LITERATURE. The Celtic languages are divided into two groups, Gaelic and Cymric. To the latter of these the Welsh belongs, and has even given name, as forming the most important member of the group, which comprises besides, Armorican (spoken in Bretagne) the Cornish (now extinct). A controversy has been waged concerning the nature and closeness of the intimacy existing between the Gaelic and Cymric tongues, but the question may now be considered settled by the researches of the Rev. Richard Garnett ("Gentlemen's Magazine," May 1839), who found on examining the monosyllabic words in the introductory part of Nelson's "Irish Grammar," that out of 210, no fewer than 140 were identical in sense and origin with corresponding Welsh terms, that 40 were cognate, an equal number borrowed from Latin, Saxon, &c., and that only 30 were peculiar to the Gaelic. Nevertheless, it is not to be supposed that the affinity is as close as that which exists between English and so-called Scotch. It is rather (according to Mr Garnett) such as exists between Icelandic and German. A Welshman cannot understand a Highlander or an Irishman; he cannot even understand a Breton (as used to be believed), though the language of the latter is undoubtedly Cymric. Most extraordinary hallucinations were formerly current in regard to the antiquity of the Cymric tongues. Pearson, the Breton investigator, gravely affirmed that Welsh and Armorican (which he considered the same) had been "the language of the Titans, that is, the language of Saturn, Jnpiter, and the other principal gods of heathen antiquity." The Rev. Joseph Harris, editor of the "Seren Gomer," remarked in 1814 that "it is supposed by some, and no one can disprove it, that Welsh was the language spoken by Adam and Eve in Paradise." The *fact*, on the other hand, is, that of the two branches of Celtic, the Cymric is less ancient than the Gaelic, and that among the Cymric tongues the Cornish is probably older than the Welsh. (See Norris, "Ancient Cornish Drama," Oxford, 1869.) But preposterous as the views of most patriotic Welshmen are on this subject, it is undoubtedly true that the Welsh is one of the oldest living languages in Europe, and that it possesses a literature reaching back to remoter times than that of any modern tongue except Irish. The most striking peculiarities of the language are the abundance of its grammatical permutations, and its facility in forming derivatives and compounds. Of the former, two examples may be given by way of illustration. The Welsh word for "father" is *tad*; for "my," *fy*. But you cannot say for "my father," *fy tad*. After *fy*, every word beginning with *t* must change the *t* to *nh*; and therefore the correct phrase is *fy nhad*. So after *ei*, *tad* becomes either *dad* or *thad*, according as *ei* means "his"

or "her." The rules of permutation are almost endless, and, in the opinion of such Welsh scholars as are not Welshmen, useless, nothing being gained in point of euphony or expressiveness. The Welsh affirm that their language is exceedingly harmonious, and it would serve no good purpose to dispute the assertion; but foreigners ignorant of the tongue, and associating no definite ideas with the words that issue from a Welshman's lips, generally fail to realise the fact, and consider it in this respect—though not in others—distinctly inferior to Gaelic. The language, or rather the structure of sentences and the phraseology, exhibits a certain stateliness, or even grandiloquence, characteristic, indeed, of uncivilised nations. One thing specially deserves notice. The Welsh people are profoundly attached to, and familiar with it. It is not dying out, like Irish or Scotch Gaelic. It has a genuine literary, as well as oral existence even now, and though the changes it has undergone since the days of Taliesin are numerous and great—so great indeed, that no modern unlettered Cambrian can understand a word of the early poetry of his country—yet it is essentially the same tongue as Cæsar and Agricola heard, and is consequently to be regarded with veneration as the solitary living link that unites those distant ages with our own.

There are extant, says Owen Pughe, some thirty old treatises on Welsh grammar and prosody. The most important of these is one composed by Geraint (880 A.D.), revised by Einion (1200 A.D.), and regularly privileged by the sovereigns who then exercised authority in Wales. It was first printed by the Welsh M.S. Society in 1856, under the editorship of the Rev. J. Williams ab Ithel. Among English grammars of the Welsh language, the best is said to be that by the Rev. Thomas Rowland (2d ed. 1857); among dictionaries, that of Owen Pughe, entitled "*Geiridwr Cymraeg a Saesoneg, a Welsh and English Dictionary*" (2 vols. 1793; 3d ed. 1861, *et seq.*). It is, however, only a Welsh-English dictionary; the most satisfactory English-Welsh dictionary is that published by Daniel Silvan Evans (2 vols., Denbigh, 1852—1858).

The literature of Wales has been arranged into four periods: the *first* extending from the earliest times to the Norman Conquest (1066 A.D.); the *second*, from the Norman Conquest to the English Reformation (*circa* 1536 A.D.); the *third*, from the English Reformation to the beginning of the reign of George III. (1760 A.D.); and the *fourth*, from 1760 to the present day. To what date the oldest specimens of Welsh literature ought to be assigned, has been the subject of sharp dispute. These specimens are in verse, and are rhymed. The chief of their alleged authors, with their supposed periods are Aneurin (510—560 A.D.), Taliesin (520—570 A.D.), Llywarch Hen, or "the Old" (550—640 A.D.), and Myrddin or Merlin (530—600 A.D.). According to Pinkerton (see his preface to "*Barbour*") and Laing ("*Dissertation on Ossian*"), they are not authentic; but the vindication of their authenticity, first by Sharon Turner, in 1803, and afterwards, and more critically, by Mr Stephens of Merthyr-Tydvil, in his "*Literature of the Kymry*" (1849), and Mr Nash, in his "*Taliesin, or the Bards and Druids of Britain*" (1668), is considered conclusive. The last two of these writers, however, may almost be said to meet their opponents half-way. Of the seventy-seven poems ascribed to Taliesin in the "*Myvyrian Archæology of Wales*" (a collection of all the most celebrated works in Welsh literature, 500—1400 A.D.), which appeared in 1801—under the auspices of Mr Jones, Mr Edward Williams (better known as "Edward of Glamorgan"), and Dr Owen Pughe—Mr Stephens considers fifty-seven to be demonstrably spurious, and only twelve to be probably genuine, that is, belonging to the age of Taliesin. Mr Nash enables us to form an independent judgment on the point, for he translates some fifty of these poems, and we find that, instead of their exhibiting an antique Welsh character, they abound in allusions to mediæval theology, and frequently employ mediæval Latin terms. It is certainly unfortunate for the reputation of the "*Chief of the Bards*," that the specimens of his which are considered to be genuine possess exceedingly small poetic merit. The life of this famous but apparently over-rated genius is, of course, enveloped in legend. He is said to have been the son of a certain St Henwg, and to have been educated at the College of St Cadog. His life was spent successively at the courts of Urien Rheged, Gwyddno, Prince of Cardigan, and King Arthur, and his sepulchre is shown near Aberystwith. It is still called *Bedd Taliesin* (Taliesin's Grave). Of the poems whose authorship is ascribed to Aneurin, a prince

of the Cumbrian Britons, the most notable is that entitled "Gododin," in which he pathetically laments a defeat of his countrymen by the Saxons. It is reckoned authentic. Several English translations of the "Gododin" have been published and a translation of the whole works of Aneurin was published by Mr. Probert in 1820.) Llywarch Hen, also a Cumbrian warrior, is regarded as the finest and most poetical of all the semi-historical Welsh bards. Tradition reports that he lived to the age of 150. The burden of his verse is the miseries of old age, on which he descants with melancholy eloquence. (See "The Heroic Elegies and other Pieces of Llywarch Hen, Prince of the Cumbrian Britons," with a literal translation by William Owen, 1792.) The pieces ascribed to Merddyn, in the "Myvyrian Archæology," are in all probability spurious. Besides the names already mentioned, the other poets of the first period are Gwyddno, Gwilym ab Don, Golyddan, &c.

The earliest specimen of Welsh prose now extant is the collection of the laws of King Hywel Dda, or Howel the Good (died 748 A.D.)—a work of great value in illustrating the manners and morals of early Welsh times, but it is very uncertain when or by whom the collection was made. The oldest extant MS. belongs to the 12th century. The latest and most critical edition (Welsh and English) is that published in 1841 by the Record Commission, and edited by Aneurin Owen, son of Dr Owen Pughe. Another work, entitled "The Wisdom of Cadog the Wise" (a collection of proverbs pretending to be by a St Cadog, who flourished in the 6th c., and was a friend of Taliesin), is of such doubtful authenticity that its claim can only be noticed in our sketch.

Second Period, 1066—1586.—A few years after the date of the Norman Conquest, a new spirit was imported into Welsh poetry by the influence of Gruffydd ab Cynan, Prince of North Wales, and Rhys ab Tewdwr, Prince of South Wales, particularly of the former. Gruffydd had been born during his father's exile in Ireland, and was brought up in that country, where he appears to have acquired a familiarity with both the native Celtic literature and that of the Dan-Norse invaders. In the year 1100, he held a great Eisteddfod at Caeuwys in North Wales, which was numerously attended by Irish bards and musicians. For the next three hundred years, Wales is rich in native bards, a fact that conclusively refutes the tragic story of Edward I. having caused them all to be slain, lest their patriotic songs should stir the Welsh to renew the struggle for independence. Nearly sixty names occur in the "Myvyrian Archæology" between 1120—1380. The first is that of Meilyr (1120—1160), whose best piece is entitled "The Deathbed of the Bard." Meilyr's son, Gwalchmai ab Meilyr (1150—1190), who is said to have accompanied Richard Cœur de Lion to Palestine, is a superior poet to his father. Fourteen of his productions are extant. Gwalchmai's son Einion (1170—1220), also figures as a poet. Forty pieces are ascribed to Cynddelw (1150—1200), a contemporary of Gwalchmai, of which probably the most interesting is "The Deathbed of Cynddelw." He has also some verses addressed to Prince Madog or Madoc of Powys, whom enthusiastic Welshmen conceive to have discovered America before Columbus. Other bards of this second period are Llywarch ab Llewellyn (1160—1220); Hywel, 1140—1170, a brother of Prince Madoc, and writer chiefly of erotic codes; Owain Cyveilioc (1160—1197), also of princely rank, whose "Hirias," or the "Long Blue Horn," is a great favorite with more than Welshmen; and above all, "Dawdd ab Gwilym" (circa 1340—1400), who has been compared to Ovid, to Petrarch, and Burns. In his verses Welsh poetry undergoes a change—the bardic or Scaldic spirit disappears, and a more humane, if less patriotic spirit takes its place. Dawdd sings of love and of social amusements; he was likewise a fierce satirist, though at times very penitent and pious; while, to complete his resemblance to the Scottish poet, and also to justify the biblical name he bore, he shewed an unmistakable predilection for illicit love. Dawdd's poems were first published in Welsh, with biography of the author by Owen Jones and Owen Pughe (1799). An English translation of some of them by Mr. A. Jones appeared in 1834. Besides the poets already mentioned, the following names are in high repute: Iolo Goch, the friend and bard of the famous Owen Glendower, who is said to have lived to the age of 120; Sion Cent ("John of Kent"), a name given him from Kent-church, in Hereford, where he resided (1380—1410), and who, having adopted the opinions of the Lollards, ultimately attained the reputation of a wizard; and Lewis Glyn Cothl, who flourished during the Wars of

the Roses, and was bard to Jasper, Earl of Pembroke, son of Owen Tudor and the widow of Henry V.

Prose.—The oldest Welsh chronicler of the second period is Caradoc, a monk of Llancarvan, who flourished in the first half of the 12th century. His work narrates in Welsh the history of his native country from the death of Cadwallader, 689, to the time of Caradoc himself. It is a dry, illiterate affair, like the Anglo-Saxon Chronicle. Contemporary with Caradoc was the famous Geoffrey of Monmouth (q. v.), Bishop of St Asaph, who died in 1154. He, however, though a Welshman, wrote in Latin, and belongs, therefore, rather to the general literature of England than to Welsh literature. His "Chronicle" commences with the fall of Troy, and ends with the death of Cadwallader, so that it forms an introduction to that of his friend Caradoc. In it the legend of Arthur first assumes that romantic and chivalrous form in which modern readers are familiar with it. It is impossible here to enter into a discussion of the question where the materials of the Arthurian romance were first accumulated; suffice it to say, that evidence preponderates in favor of their Welsh origin. To this second period must also be assigned that charming collection, the "Mabinogion," or Children's Tales, of which a MS. volume of more than 700 pages is preserved in the library of Jesus College, Oxford, and is known as the "Red Book of Hergest," from the name of the place where it was discovered. A beautiful edition of this work in Welsh and English, with preface and notes, was published in 3 vols. (1833—1849) by Lady Charlotte Guest. The age of these tales, which relate principally to Arthur and the Round Table, is doubtful. The transcription in the "Red Book of Hergest" belongs probably to the 15th c.; but the date of their composition may be safely held to be much earlier, perhaps somewhere in the 13th century.

The "Triads" may also be here noticed. They are collections of historical facts, maxims ethical and legal, mythological doctrines and traditions, and rules for the structure of verse; all expressed with extreme brevity, and regularly disposed in groups of three. They were a very popular species of composition among the Welsh, and are of all ages. Examples occur in the poems of Llywarch Hen, but the greater part are found in transcripts and miscellanies of the 16th and 17th centuries. The "historical" triads are especially puzzling. They occur in a so-called collection, made by one Thomas Jones of Tregaron, about the close of the 16th century. This Jones was originally, it seems, an eminent robber—a Welsh "Rob Roy;" but in his later years he reformed, married an heiress, and became a justice-of-peace for the county of Brecon. The peculiarity of his "Collection" is, that it gives a totally different account of the origin of the Britons from Geoffrey of Monmouth, bringing them from a "Summer Land" (supposed to be Constantinople or the Crimea) over a sea called the "Hazy Sea." The question arises, and has not been settled: Whether are we to suppose Jones the fabricator of these "triads," or his account of the origin of the Britons the genuine record of an ancient tradition? In favor of the former hypothesis, unfortunately, is the circumstance that there is no trace of such an ancient tradition in the anterior literature of Wales.

Third Period (1536—1770).—This and the remaining period may be briefly sketched. The most notable fact in its commencement is the comparative ease with which the Reformation made its way among the Celts of Wales. The Celts of the Highlands remained for a time, and those of Ireland remain to this day, obstinate adherents of the old faith; but those of Wales, on the whole, swiftly accepted the new religion. The art of printing had been in operation in England for more than half a century before it was applied to the Welsh language. The first book printed in the Welsh or any Celtic language was an almanac, with a translation of the Lord's Prayer and the Ten Commandments (Lond. 1546). The author, William Salesbury, was a scholar and a zealous Protestant. In 1547, he published the first dictionary of English and Welsh, and executed the greater part of the first translation of the New Testament into his native tongue (Lond. 1567). In 1588, appeared the earliest translation of the whole Bible into Welsh. The author was a Dr William Morgan, afterwards Bishop of St Asaph's. A revised edition of this, in 1690, by Dr Parry, Morgan's successor in the bishopric of St Asaph's, is the translation still in use among the natives of the Principality. Contemporary with Salesbury, but an adherent of the old faith, was Dr. Griffith Roberts, who lived on the continent, and published at Milan a Welsh Grammar in 1567. Another contemporary was

Dr John David Rhys, whose principal work, "*Cambrobrytannicæ Cymræcæve Lingvæ Institutiones et Rudimenta*," is a treatise on Welsh grammar. The suspicious Thomas Jones of Tregaron, possible *author*, rather than collector of the "historical" triads, was a friend of Rhys, and died about 1620. In 1603, Captain Myddleton, one of the first three persons who smoked tobacco in England, published a metrical version of the Psalms in Welsh, partly executed while cruising about in the West Indies. The most celebrated poets of the *third* period are the Rev. Rees Prichard, vicar of Llandovrry (1579–1644), whose "*Canwyll y Cymry*" (Candle of the Cambrians) is a metrical version of his professional homilies or sermons, the eloquence of which had previously won for him a great reputation as a preacher; it is still popular, the 20th edition having appeared as late as 1868: Huw Morus, or Hugh Morris (1622–1709), author of a variety of pieces, which his countrymen consider unsurpassed in humor, pathos, and even sublimity—an edition in 2 vols. appeared at Wrexham (1823), under the title of "*Eos Celriog*" (The Nightingale of Celriog); and Goronwy Owen (1722—*circa* 1870), a gifted bard, but likewise an incurable drunkard, whose principal poems are contained in the first volume of a book entitled "*Diddanwch Tenlufid*" (Domestic Amusement, Lond. 1763). Of the prose writers, the only noteworthy are Ellis Wynne (d. 1784), author of the "*Bardd Cwag*" (Sleeping Bard, 1708), a series of visions of Hell and Hades, written with great beauty of style; and the Rev. Moses Williams (1685–1743), an antiquarian scholar of high merit, whose "*Repertorium Pœticum*," or List of Welsh Poems and Catalogue of Welsh Books, is very valuable.

Fourth Period (1760 to present time).—Various causes co-operated to give a new impetus to Welsh literature after the accession of George III. Among these, the most powerful were the establishment of periodical publications, the institution of patriotic societies, and the spread of Methodism. The first important production of this period is entitled "Some Specimens of the Poetry of the Ancient Welsh Bards translated into English" (Lond. 1764), by Mr Evans, curate of Llanvafr Talylhaern, in Denbighshire. The next name deserving of mention is that of Owen Jones (1741–1814), who, though engaged in mercantile occupations all his life, managed, by his enthusiasm and liberality, to quicken and extend the public interest in Welsh literature. In 1771, he founded the *Gwyneddigion* (society of the "Men of Gwynedd"), which gave prizes for the best performances on the Welsh harp, and the best Welsh poems. In 1801–1807, he caused to be published at his own expense, under the editorship of Owen Pughe and Edward Williams, three volumes of the "*Myvyrian Archæology*," so called in honour of himself, who had assumed the bardic name of Myvyr, from his native vale in Denbigh. Owen Jones was, however, rather a Welsh *Mæcenas* than a Welsh *littérateur*. The next names of importance are those of the editors just mentioned, Owen Pughe and Edward Williams. The former (1759–1835), according to Southey, was a "muddy-minded man;" nor is the fact that he was a follower of Joanna Southcott, and one of her twenty-four elders, adverse to this description of his intellect. Be this as it may, Owen Pughe is the great Welsh lexicographer; his Dictionary of Welsh (1793–1808) contains 100,000 words illustrated by 12,000 quotations. He also translated "*Paradise Lost*" into Welsh, in which work he threw off the chains of Welsh alliteration, an innovation generally acknowledged to be an improvement. Edward Williams (1745–1826), better known as Iolo Morganwg, is probably the finest Welsh genius of the fourth period. Southey knew him, and liked him greatly. His principal productions are "*Salman yr Eglwys yn yr Anialwch*" (Psalms of the Church in the Desert); but an "*Ode on the Mythology of the Ancient British Bards in the Manner of Talliesin*" (1792), accompanied by notes and specimens of "*Triads*," containing the metaphysical and religious doctrines of the old Druidical bards, provoked a long-protracted controversy. Morganwg said that he had copied them from a MS. collection of a Welsh poet, *anno* 1560, which was in his possession, and affirmed that the collection was of very great antiquity. He was often asked to produce it, but always declined; and Welsh critics of the strictest sort have now ceased to believe in its existence. The three associates in the publication of the "*Myvyrian Archæology*" had each one son, and all of these have become eminent in connection with the literature of their native country. Talliesin Williams (1787–1847), son of Edward Williams, wrote poetry both in Welsh and

English; Aneurin Owen (1799—1851), son of Owen Pughe, among other works, published an important collection of the "Laws of Wales;" while Owen Jones, son of Owen Jones, the Welsh Mæceus, is still alive, and has a high reputation as an architect, the Alhambra at Sydenham being a favorable specimen of his professional talents. The fourth period of Welsh literature is naturally richer in critical than in creative works. Among Welsh antiquaries may be mentioned the Rev. Edward Davies (1756—1831), author of "Celtic Researches" (1804) and "Mythology of the Druids" (1809); the Rev. Thomas Price (1787—1848), author of the "Hanes Cymru a Chenedl y Cymri" (1836—1842), a History of Wales and of the Welsh nation from the earliest times to the death of Llewellyn; an admirable work, comprehensive, critical, and literary (Price was an ardent and voluminous writer, contributing to no fewer than 16 periodicals at the same time); and the Rev. John Williams ab Ithel, rector of Llanymowddwy in Merioneth, and editor of the "Cambrian Journal." In 1856, he edited, for the Welsh MS. Society, the "Grammar of Edeyrn, the Golden-tongued," said to be composed about 1270; in 1860, the "Brut y Tywroglon, or Chronicle of the Princes;" and in 1861 (*et seq.*), "The Traditional Annals of the Cymry," reprinted from the Cambrian Journal. Williams is a rather credulous and uncritical writer, but a scholar of undoubted merit. Probably the ablest Welsh scholar alive is Mr Thomas Stephens of Mertyr-Tydvil, a man at once patriotic and honest, enthusiastic and critical. To him, above all others, Englishmen desirous of obtaining some clear and creditable knowledge of Welsh literature, ought to apply. His principal works are "Studies on British Biography," and "Literature of the Cymry in the Twelfth and following Centuries." The enlightened views of Stephens have met with great acceptance among such English scholars as have paid attention to the subject of Welsh history and literature.

The poetry of the fourth period is not remarkable. The principal names are—David Richards of Dolgelly (1751—1827), author of a sort of epic on the Trinity—a very unsuitable subject for an epic—and a paraphrase of the history of Joseph; David Thomas of Caernarvon (1769—1822), who was very successful at the Eisteddfods; David Owen of Givion (1784—1841), whose poems were collected and published under the title of "Blodau Arfon" (Flowers of Arvon); the Rev. Daniel Evans, a collection of whose pieces was published at Llandovery in 1831, under the title of "Gwlluan y Bardd" (The Poet's Vineyard); the Rev. Walter Davies (1761—1849), also great at Eisteddfods; the Rev. James Hughes (1779—1846); the Rev. William Rees of Liverpool, author of a spirited paraphrase of the Book of Job, &c.; and the Rev. William Williams of Caernarvon, author of "Grawn Awen" (The Treasure of the Muse), &c.

A good deal of indifferent Welsh prose has been written during this period on religious subjects, owing to the spread of Methodism among the Welsh, but it may profitably be overlooked by a foreigner; and with a glance at the history of Welsh periodicals and societies, we close our brief survey of the subject. The first Welsh periodical, edited by the Rev. P. Williams and Evan Thomas, appeared about 1770, and was entitled "Yr Engrawrn Cymraeg" (The Welsh Treasure), but the first that attained any measure of success was the "Seren Gomer" (Star of Gomer), which was published at Swansea (1814). At present, it exists as a Welsh "quarterly" of evangelical views. In 1831, "Y Drysorfa" (The Treasury) was commenced, under Calvinistic auspices; in 1836, "Y Diwygiwr" (The Reformer), and "Y Dygedydd" (The Teacher); 1833—1841, "Y Gwladgarwr" (The Patriot), more a literary than a theological magazine, and tolerably clever; "Yr Haul" (The Sun), a journal advocating the interests of the Established Church; and "Y Traethodydd" (The Essayist), commenced at Dublin (1846), distinctly the best literary organ in Wales. It discusses, in the Welsh tongue, the poetry and philosophy of modern Europe. In 1852, a new quarterly was started at Ruthyn, entitled "Taliessin," as a companion and rival to "The Essayist." The leading Welsh newspaper is the "Amseran" (Times).

A work of great value, commenced in 1856, is a Welsh Encyclopædia, under the editorship of the Rev. John Parry of Bala, and entitled "Encyclopædia Cambrensis"—"Y Gwyddonladur Cymreig." Periodicals, exclusively devoted to Welsh subjects, are the "Cambrian Register" (3 vols., 1796, 1799, and 1818); the "Cambro-Briton and General Celtic Repository" (3 vols., 1819—1822); the "Cambrian Quarterly Magazine" (5 vols., 1822—1823); and the "Cambrian Journal," begun in

654, and still going on. Another valuable periodical is the "Archæologia Cambrensis," or "Journal of the Cambrian Archæological Association," begun in 1846, and published quarterly.

The leading Welsh societies, literary and antiquarian, that have existed, or still exist, are the Cymmrodorion, established in London in 1761, which lived for 30 years; the Gwyneiddigion, also established in London in 1771, but extinct some 20 years ago; a second Cymmrodorion (1890—1848); The Society for the Publication of Ancient Welsh MSS. (founded at Abergaveunny, 1837); and the Cambrian Institute, founded in 1853.

The best work on Welsh literature, as already mentioned, is that of Mr Thomas Stephens of Merthyr-Tydvil, to which the reader is referred; as also to the various Welsh quarterlies, where almost every question in Welsh literature is copiously discussed. A very excellent and complete survey of the subject is also to be found in Knight's "English Cyclopædia," in the article "Welsh Language and Literature."

WELSH ONION, or Cibol (*Allium fistulosum*; see **ALLIUM**), a perennial plant, a native of Siberia. It has fistular leaves and no bulb. Its leaves appear very early in spring, and are then used in soups and salads. Its flavor more resembles that of garlic than of the onion. It has been long cultivated in kitchen-gardens in Britain, and perhaps deserves more attention than it receives, because it is ready for use before any similar plant in spring. The seed is sown in spring or summer; leaves fit for use are produced in the following spring, and the bed continues to be productive for a number of years. The name Welsh Onion is from the German *wälsch*, and merely indicates a foreign origin.

WELSHPOOL (often vulgarly called Pool), a municipal and parliamentary borough of North Wales, in the county of Montgomery (of which it is considered the capital), 18½ miles west-south-west of Shrewsbury. Powis Castle is an ancient edifice, the oldest parts dating from the 12th c.; and the park is much admired. Woollen mills, tanneries, and malt-houses are in operation. Pop. of parliamentary borough (1871) 6968. W. is connected by a branch with the Shrewsbury and Hereford and other railways.

WENDS (from the same root as to *wend*, to *wander*, and signifying the wandering or roving border tribes), the name given by the Germans to a branch of the Slaves (q. v.) which, as early as the 6th c., occupied the north and east of Germany from the Elbe along the coast of the Baltic to the Vistula, and as far south as Bohemia. They were divided into several tribes, which were successively subdued by the Germans, and either extirpated or gradually Germanised and absorbed, although remnants of them are still here and there to be found.—In a narrower sense, the name of Wends is given to those remnants of the Slavic population of Lusatia who still speak the Wendic tongue, and preserve their peculiar manners and customs. They number about 150 000. A collection of Wendic songs was published by Haupt and Smaller (2 vols., Grimma, 1843—1844). The Wends, like the other subject Slavic tribes, were, in early times, cruelly oppressed by their German masters; in recent times their lot has been more tolerable.

WENER, Lake, the largest lake in the Scandinavian peninsula, and after the lakes Ladoga and Onega in Russia, the largest in Europe, is situated 150 miles west-south-west of Stockholm, and about 40 miles inland from the Cattegat. It is over 90 miles in length and varies from 15 to 48 miles in breadth, is 909 feet in greatest depth, and lies 150 feet above sea-level. Area, 2005 square miles. From the north shore a peninsula extends southward into the middle of the lake; and from the southern shore a peninsula extends northward to within about fifteen miles of the point of the northern peninsula; the portion of the lake lying to the west of these peninsulas receives the name of Dalbo Lake. Of the numerous rivers that feed the lake, the chief is the Klar, from the north, and its surplus waters are discharged into the Cattegat by the river Göta. It is connected by a canal with Lake Wetter, by means of which the Göta Canal, Lake Roxen, &c., inland communication is established between the Cattegat and the Baltic Sea. The lake is rich in fish; it is often visited by sudden gusts of wind, and is in many places too shallow for navigation.

Wenlock
Were-Wolf

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WENLOCK, a parliamentary and municipal borough in the county of Salop, 12 miles south-east of Shrewsbury. Pop. of parliamentary borough (1871), 21,208. The principal buildings in Much Wenlock are the church, a building of considerable antiquity, bearing traces of Saxon and Norman architecture; and the town-hall, a venerable and interesting structure, decorated internally with elaborate oak carvings of the time of Charles II. There are also a savings-bank, and a public library and reading-room. The extensive ruins of Wenlock Abbey afford a rich treat to antiquaries. The abbey was founded in the year 680, and was the parent church of Paisley Abbey, Scotland. The remains have been carefully preserved from further dilapidation by the owner, J. Milnes Gaskell, Esq., formerly M.P. for the borough, who converted a portion of them into an occasional residence for himself. W. is an ancient municipality, with separate quarter sessions, and is the first borough that acquired the right by charter of representation in parliament. The town of Wenlock proper, or Much Wenlock, is but small; but the parliamentary borough comprises 12 parishes spreading over a large area, and includes the market-towns of Madeley, Brosley, and Ironbridge, and the populous district of Coalbrookdale, where important iron and brick and tile works are carried on. There are also extensive limestone quarries in the neighborhood. There is a railway connecting W. with the Severn Valley Railway at Buildwas, and another connected with the Shrewsbury and Hereford line.

WENLOCK GROUP, an important series of rocks of Upper Silurian age, which are largely developed in the neighborhood of Wenlock. The group is divided into an Upper and Lower series. The Upper, known as the Wenlock Limestone, consists of a considerable thickness, sometimes reaching 300 feet, of a gray subcrystalline limestone, so hard that it has withstood the weathering which has removed the softer shales above and below it. It forms a ridge parallel to that of the Aymestry limestone, running for 20 miles north-east to south-west through the south-eastern portion of Shropshire. Sometimes it contains huge concretionary masses of crystalline carbonate of lime, locally named "ball-stones;" in other places, it becomes thin and flaggy. It abounds in fossils, especially in corals, crinoids, mollusca, and trilobites. The Lower Wenlock series consists of 1450 feet of Wenlock shale, and 150 feet of Woolhope limestone and grit. The Wenlock shale is generally a dark gray, almost black argillaceous rock, often containing elliptical concretions of impure earthy limestone. It is worked in some places for flagstones and slates. The Woolhope limestone and grit consists of gray argillaceous nodular limestones resting on blue shales. In Denbighshire, it appears as a coarse grit, often of great thickness, and producing a very barren soil. The fossils of the Lower Wenlock beds are of a similar character to those of the Upper series.

WENS are encysted tumors, much more common on the scalp than in any other situation, though occasionally observed on the face, shoulders, &c., and consisting of obstructed sebaceous glands, which enlarge by the internal pressure of their accumulated secretions. The closed orifice may be often noticed in the form of a small dark point, and in that case the duct may sometimes be gradually enlarged by the gentle introduction of a probe or director, and its contents pressed out. By this treatment, they may, at all events, be kept from being unsightly, and will sometimes shrivel up and disappear. If this treatment fail, and the patient finds the tumor so annoying that he insists upon its removal, it must be exterminated with caustic or the knife.—In consequence of the well-known dangers (especially erysipelas) that frequently follow cutting operations of the scalp, the caustic treatment is generally preferable. The most prominent part of the wen must be thoroughly cauterised with nitric acid or potash, which will lead to the formation and separation of a slough, which will lay open the tumor, which may then be left to empty itself and wither, or may be emptied by pressure, and cauterised within. As a general rule, wens are better left alone, unless they can be emptied by simple pressure, as severe operations on them are frequently attended with danger.

WENTLETRAP (*Scaloria*), a genus of gasteropodous mollusca, of the family *Turritellidae*. The shell is spiral, with many whorls, the whorls deeply divided, and not always close together, crossed by remarkable elevated ribs, the aperture round and rather small. The animal is furnished with a proboscis, and has the eyes placed on an external convexity, the foot short and oval. About one hundred

species of this genus are known. Those which have the whorls close together are called False Wentletraps by shell-collectors, those in which they are not contiguous are known as True Wentletraps. Of the former, some are found in northern seas, as *Scalaria communis* on the coasts of Britain and of continental Europe, and *S. Grænländica* on those of North America. *S. Grænländica* is particularly abundant on the banks of Newfoundland, and forms part of the food of the cod. The true Wentletraps are all natives of the seas of warm climates. Some of them are very beautiful. A species found in the south-east of Asia, and known as the Precious W. (*S. pretiosa*), was once in such esteem amongst shell-collectors, that an extremely fine specimen is said to have been sold for 900 guineas; and an ordinary price was from three to five pounds. This shell may now be purchased for a few shillings. It is from an inch and a half to two inches long, snow-white, or pale flesh-coloured, with eight separated—but not widely separated—whorls.

WERDAU, a town of Saxony, on the river Pleisse, 40 miles directly south of Leipzig, and 49 by railway. Pop. 11,216, mostly engaged in manufacturing cloth and in yarn-spinning.

WERDEN, a town of Rhenish Prussia, on the Rhine, 17 miles north-east of Düsseldorf. Pop. (1871) 6685, employed in the manufacture of cloth, linen, and silk, and alum, and coal mining.

WEREGILD (Ang.-Sax. *wer*, man; and *geld*, satisfaction), a composition by which, according to the custom of the Anglo-Saxons, Franks, and other Teutonic people, homicide and other heinous crimes against the person were expiated. There was an established progressive rate of weregild for homicide, varying at different times and among different Teutonic tribes, from the weregild of the *ceorl*, or peasant, to that of the king. In the time of Tacitus, the weregild for homicide among the Germans was due to the relatives of the deceased; that for other crimes one-half to the injured party and one-half to the state. The sum paid to the relatives in case of homicide, also known as the *man-teyrt*, seems to have been looked on as the equivalent of the dead man's value. As the power of the community or king increased, the exaction of retribution for the death of its members was considered to be the duty of the state as well as of the relatives, and the principle of division was applied to homicide as well as minor crimes; each payment being a separate full equivalent for the value of the deceased, the one to appease the feud, the other to make atonement to the state. This double weregild is recognised in the compensation for the death of a king by the laws of the Merclans and Northumbrians. In the days of Edward the Elder the weregild had become a much more complicated penalty, the composition for homicide consisting of four different payments, two of which, the *fight-wite*, or penalty for a breach of the peace, and the *weregild*, went to the king as head of the state; while a sum called the *halefang* was paid to the kindred to loosen the hand of the avenger of blood, and the *mandote* was given to the overlord to compensate him for the loss of a vassal. The graduated scales of weregild in use among the different Teutonic nations throw much light on the gradations of society at the period. It does not appear that among the nations who recognised the principle of weregild, the relatives were bound to accept a compensation for their kinsman's slaughter, in place of appeasing the death-feud by blood; the latter practice was often resorted to instead. It was only through the exertions of Archbishop Theodore that Egfred, the Christian king of the Angles of Northumbria, adopted the alternative of accepting a weregild for his brother slain in battle by the Merclans, in place of demanding the blood of the slayer. A similar principle to that of weregild for homicide seems to have been recognised by the Celtic nations, and there are traces of it in the Mosaic code.

WERE-WOLF (Ang.-Sax. *wer*, a man), a man-wolf, a man who, either periodically or for a time, is transformed, or transforms himself into a wolf, becoming possessed of all the powers and appetites of a wolf in addition to his own, and being especially remarkable for his appetite for human flesh. The belief in the transformation of men into wolves or other beasts of prey has been very widely diffused; there is perhaps no people among whom some evidence of its former prevalence does not exist. It is not yet extinct, even in Europe. In many of the rural districts of France, the *loup-garou* (the latter part of the word is a corruption of the Teutonic *wer-wolf*), is still an object of dread. This superstition lingers

too among the country-people of Northern Europe, and a particular form of it flourishes vigorously among the Bulgarians, Slavonians, and Serbs, and even among the more intelligent inhabitants of Greece. See *VAMPIRE*. Its details vary in different countries and districts. The definition given above includes only the commonest and the best marked of its incidents. Probably, it has not yet entirely disappeared in any country whose rural districts are infested with wolves or other wild animals; and manifestations fitted to suggest it may be occasionally observed in the mad-houses of most countries. See *LYCANTHROPIA*. The animal whose shape is taken, as already stated, is not always, though usually, a wolf; it was probably always the animal most formidable, or considered most inimical to man. In Abyssinia, it is the hyæna.

Occasional notices of lycanthropy, as it is called, are found in classical writers; and lycanthropy, as there described, was the change of a man or woman into a wolf, so as to enable the man or woman to gratify an appetite for human flesh, either by magical means, or through the judgment of the gods, as a punishment for some dire offence. Sometimes the transformation was into the shape of a dog or a bull. Ovid, in his "*Metamorphoses*," tells the story of Lycæon, king of Arcadia, who, when entertaining Jupiter at a banquet, resolved to test his omniscience by serving up to him a hash of human flesh. The god, to punish him for this, transformed him into a wolf. Herodotus describes the Næuri as sorcerers who had the power of taking once a year, for several days, the shape of wolves; and the same account of them is given by Pomponius Mela. Pliny relates that, in Arcadia, every year, at the festival of Jupiter Lycæus, one of the family of Antæus was chosen by lot, and conducted to the brink of the Arcadian Lake, into which, after having hung his garments upon a tree, he plunged, and was transformed into a wolf. Nine years after, if alive, he returned to his friends, looking nine years older than when he disappeared. Some notices of lycanthropy are to be found in Petronius; and allusion to it is also made by Virgil in the 8th "*Eclogne*." Marcellus Sidetes tells us of men who, every winter, were seized with the notion that they were dogs or wolves, and lived precisely like these animals, spending the night in lone cemeteries. This disorder attacked men chiefly in the beginning of the year, and was usually at its height in February. It is worth while observing that the classical instances of lycanthropy mostly refer to Arcadia, a pastoral country, whose inhabitants suffered greatly from the ravages of wolves.

In Norway and Iceland, it used to be believed that there were men who were "not of one skin." Such men could take upon themselves other shapes than that of man, and the natures corresponding to the shapes which they assumed; they had the strength and other powers of the animal whose shape they bore, as well as their own. It was believed that the change of shape might be effected in one or three ways: simply by putting on a skin of the animal; by the soul of the man deserting the human body—leaving it for a time in a cataleptic state—and entering into a body borrowed or created for the purpose; or, without any actual change of form, by means of a charm, which made all beholders see the man under the shape of the animal whose part he was sustaining. The two former were the common modes of transformation; at any rate, the Sagas are full of illustrations of them; while illustrations of the third mode are comparatively rare. Nothing of the man remained unchanged except his eyes; by these only could he be recognised. Odin had, and freely exercised, the power of varying his shape. When men change their shape to prey upon their kind, they always took the form of a wolf. It was believed that many had the power of thus transforming themselves; and great was the popular dread of were-wolves. Perhaps the best stories of were-wolves which are to be found are contained in the Northern Sagas. Scarcely anywhere did the belief in them go so deep into the minds of the people as among the northern races. In connection with it, notice may be taken of what is called the "*Berserker rage*," which appears to have been a peculiar form of mania. The Berserker yelled like dogs, or wolves rushing into conflict, bit their shields with their teeth, and committed terrible atrocities while the paroxysms of their disease were upon them. Berserker has been rendered "bare-skinned;" others make it mean "wolf-skin-coated" (why not "bear-skin-coated?").

Olaus Magnus states that in Prussia, Lithuania, and Livonia, though wolves were very numerous and troublesome, the ravages of the were-wolves were regarded as

much more serious. Every year at the feast of the Nativity at night, the were-wolves assembled in great numbers at appointed places, and proceeded to look out for human beings, or tame animals, upon which they could glut their appetites. If they found an isolated house, they entered it, and devoured every human being and tame animal it contained; after which—shewing that they were not common wolves—they drank up all the beer or mead. Similar testimony with regard to Livonia is given by Bishop Majolus, who adds, that the transformation into the wolf-form continued for twelve days.

Instances of persons being changed into wolves by way of punishment, were freely believed in the middle ages; for example, St Patrick was believed to have changed Veretinus, king of Wales, into a wolf; and there was an illustrious Irish family which had incurred the curse of St Natalis, every member of which, male and female, according to the popular belief, had to take the shape of a wolf, and live the life of a wolf for seven years.

In the 15th and 16th centuries, the belief in were-wolves was, throughout the continent of Europe, as general as the belief in witches, which it had then come to resemble in many respects. It gave rise to prosecutions almost as frequent as those for Witchcraft (q. v.), and these usually ended in the confession of the accused, and his death by hanging and burning. It was calculated to inspire even greater terror than witchcraft, since it was believed that the were-wolves delighted in human flesh, and were constantly laying in wait for solitary travellers, and carrying off and eating little children. The were-wolves, like the witches, were now regarded as servants of the devil, from whom they got the power—often exercised by anointing with a salve—of assuming the wolf's form; and it was believed that great numbers of them trooped together to the devil's Sabbath. The stories of mutilations and other mishaps befalling them in the wolf-state, by which, when they resumed the human form, they were identified as were-wolves, exactly resemble the stories told of witches. In September 1578, we find a court of parliament sitting at Dole, in Frauche-Comté, authorising the country-people to take their weapons, and beat the woods for a were-wolf, who had already—thus went the recital—"carried off several little children, so that they had not since been heard of, and done injury to some horsemen, who kept him off only with great difficulty and danger to their persons." Throughout Europe, the judicial cognizance of witchcraft and of lycanthropy ceased at the same time. In Great Britain, where wolves had early been exterminated, the were-wolf was only known by rumors coming from abroad; but the belief that witches could transform themselves into cats and hares, which did prevail, was precisely analogous to the belief in were-wolves, especially in its later forms.

The later forms of this strange belief were obviously sophisticated. In its earlier shape, three things are to be noticed—the power ascribed to the were-wolf of transforming himself, either by changing the shape of his own body, or projecting his spirit into another body; his appetite for human flesh; his taking the shape and nature of the animal held to be most malicious against man—the wolf. As to the first of these, all that can here be done is to point to its connection with the doctrine of Transmigration (q. v.), and to add that it has been one of the commonest of human beliefs. As to the second, is it unlikely that in the early times in which the superstition had its origin, the appetite for human flesh may have been common enough to spread terror through whole districts? It is, at least, not improbable that every race of men has had an experience of cannibalism; and it may well have been that, in occasional cases, especially under conditions of disease, the taste for human flesh survived the general practice of using it. Modern Europe affords many unquestionable examples of this taste existing and being indulged in the midst of comparative civilization. There can be no doubt that some of the unhappy multitude put to death as were-wolves had really murdered and eaten the flesh of human beings. But secret murders, unaccompanied by cannibalism, would tend to support a popular belief in cannibalism. We have not to go out of our own age for proofs of the existence of men afflicted with a homicidal tendency; and in the times when the means of detecting crimes were very imperfect, it is conceivable that the murders committed by one or two such persons would spread terror, and give support to a superstitious theory throughout a large district. The Maréchal de Retz, who lived in the time of our Henry VI., had caused

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to be stolen and put to death by torture, under the most inhuman circumstances, many hundred children—he confessed on his trial that he murdered 120 in a single year. (A memoir of Gilles de Laval, Maréchal de Retz, has been compiled from authentic documents by P. J. Lacroix, the eminent French antiquary.) Perhaps no society has ever been free from men similarly constituted, and acting similarly according to their opportunities. As to the third point, if it be granted that a certain practice of, or general suspicion of cannibalism existed among a people who believed in the power of transformation, it is easy to understand how the cannibal, getting his victims by stealth, was supposed to indulge his inhuman appetite under the guise of the animal most unfriendly to man. And the existence of a form of mania in which the madman had the hallucination that he was changed into a wolf, yelled like a wolf, lived in many respects like a wolf, was calculated strongly to confirm the belief in men-wolves. In conjunction with the mischief done by real wolves, this itself may be thought almost enough to have given origin to the superstition. The hallucination of having undergone transformation into a wolf from time to time, seems to have been one of the commonest by which weak and crazed brutes were possessed during the period when the hunt for were-wolves was kept up. The literature of this subject, though abundant, is for the most part fragmentary, and mixed up with other matters. A good account of the subject will be found in "The Book of Were-wolves," by Sabine Barling-Gould. (Lond. 1865.)

WERNER, Abraham Gottlieb, a celebrated mineralogist and geologist, born at Wehran, on the Queiss, in Upper Lusatia, September 26, 1750. His father was a director of a smelting work, and he was thus led almost in childhood to the study of minerals. After some time spent at the Mineralogical Academy of Freiberg, he went to Leipzig, where he studied natural history and jurisprudence. Here, at the age of 24, he published his first work on mineralogy, a mere pamphlet on the external characters of minerals. In 1776, he was appointed Professor of Mineralogy, and curator of the Mineralogical Cabinet at Freiberg. In 1780, he published the first part of a translation of Cronstedt's "Mineralogy." In his notes to which he gave the first outlines of the system which bears his name. In 1791, he published a "Theory of the Formation of Metallic Veins," which was translated into English and French, and greatly extended his reputation. He was not, however, a voluminous author, but his views were diffused by his pupils, among whom were the most eminent German mineralogists of the time. In 1792, he was appointed Councillor of Mines in Saxony. He died at Dresden in 1817.

W.'s influence was very great in the promotion both of mineralogy and of geology. In his mineralogical system, minerals were distinguished and arranged chiefly according to their external characters; and mineralogists have now learned to depend much more than he did on their chemical constitution. In geology, he did great service by arranging the facts already known, and guiding to proper methods of observation. His theory was extensively received for a time. It may be described as the opposite of the Huttonian theory, accounting for the present state of mineral substances in general by supposing them to have been dissolved or suspended in water; whilst the Huttonian theory ascribed almost everything to the action of fire. W.'s is sometimes called the Neptunian theory, whilst that of Hutton is styled the Plutonic. Modern geology recognises a certain measure of truth in both, but rejects them alike in that character of completeness or universality in which they were once advocated. W. classified rocks into Primary, Transition, and Secondary; and the terms are still sometimes used, although merely as convenient names, not as indicative of opinions concerning the rocks designated by them.

WERNIGERO'DE, a small walled town of Prussia, in the government of Magdeburg, and 48 miles south-west of the city of that name, stands at the northern base of the Brocken Mountain. Its castle, the residence of the counts Stolberg-Wernigerode, comprises a library of 40,000 volumes, and a zoological garden. It manufactures linen, cloth, and tobacco; and carries on copper-smelting and paper-making. Pop. (1871) 6794.

WESEL, a strongly fortified town of Prussia, on the Rhine, 82 miles north-north-west of Düsseldorf. The Rhine, which here is joined by the Lippe, is divided by a fortified island, and crossed by a bridge of boats, protected on the left bank by a fort.

Of its churches, the Willibrod Kirche was first opened in 1181. Cloth, hosiery, serge, leather, hats, tobacco, and linen are manufactured, and book-printing is carried on. The citadel is defended by about 4500 men. Pop. (1871), inclusive of garrison, 18,512.

WE'SER (Lat. *Visurgis*), a river of Germany, formed out of the Werra, which rises in the Thuringer-Wald, and the Fulda, rising in the Rißgebirge, on the frontiers of Prussia and Bavaria. These streams, after a northern course, unite at Münden, in Hanover; and the united stream, the W., flows north through Prussia, till, passing Bremen, it forms for about 40 miles the boundary between Oldenburg and Prussia, and enters the North Sea by a wide but shallow estuary, much interrupted by sand. Entire length, 260 miles. It communicates with the Elbe by a navigable canal; but though considerably improved in this respect, the W. is not of much use as a navigable stream. The principal trading-town on its banks is Bremen.

WESLEY, John, the founder of the Methodists (q. v.), was born at Epworth, in Lincolnshire, England, 17th June 1703. The family name was variously spelled Wesley and Westley, and is supposed to be the same with Wellesley, and to be derived from a place of that name near Wells. An Irish gentleman, Garrett Wellesley, Esq., of Dungannon, offered to make Charles Wesley, younger brother of John, his heir, on condition of his settling in Ireland, believing him to be of his own family. The offer was not accepted; and the estate of Mr Wellesley went to another branch of the family, which was soon raised to the Irish peerage, with the title of Earl of Mornington, and from which the Duke of Wellington and the Marquis of Wellesley sprang. The more immediate progenitors of John W. were ministers of the church of England of Puritan principles. Some of them suffered for non-conformity. Bartholomew Wesley, the great-grandfather of John, was ejected from his living by the Act of Uniformity in 1662. John Wesley, the son of Bartholomew, was also deprived of his living and was often fined, and several times imprisoned for preaching contrary to the law. Samuel Wesley, a son of this John Wesley, conformed to the Church of England, but opposed the schemes of James II., refusing to be bribed by offers of preferment, which, on account of his erudition and talents, it was thought worth while to make to him. He supported the cause of the Revolution, in circumstances of personal danger, and in the beginning of the reign of William and Mary, was rewarded with the living of Epworth. He wrote an epic poem entitled "The Life of Christ," and other similar works. He had a family of nineteen children. His wife, Susannah Annesley, the daughter of an ejected minister, was a woman of remarkable intelligence and fervent piety, who devoted herself very much to the education, and particularly the religious education, of her children. His eldest son, Samuel, head-master of Tiverton school in Devonshire, was a Tory and High Churchman, who strongly disapproved of the "new faith" and peculiar course of his brothers John and Charles. John W. was the second son of Samuel, or the second who grew up to manhood. In his fancy, he had a narrow escape from being burned to death, when the parsonage of Epworth was burned by some of the parishioners in their rage against their pastor for his faithful reproof of their vices. Another remarkable story is connected with the parsonage of Epworth, and with the early years of John W.'s life—the continued disturbance of the family, throughout a considerable time, by loud knockings and other noises, which could not be accounted for, and which therefore were regarded as preternatural, although Mr Wesley and his household were less affected by the strange visitation than perhaps its authors expected them to be, and persisted in residing in the parsonage, even making sport of "Old Jeffery," their unseen visitant, who "was plainly a Jacobite goblin, and seldom suffered Mr Wesley to pray for the king and the Prince of Wales without disturbing the family prayers."

John W. was a very diligent and successful student. The religious history of his college life belongs to the history of Methodism (q. v.). After much conscientious hesitation as to his motives and fitness for entering into the clerical profession, he was ordained deacon in 1725, and in 1726 he graduated as M.A., and was elected fellow of Lincoln College, Oxford. In the same year he was appointed Greek lecturer and moderator of the classes. He became curate to his father at Wroote, a small

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living which Samuel W. held along with that of Epworth, and whilst serving here, he was advanced to priest's orders in 1738. He returned to Oxford, and along with his younger brother, Charles, entered into those religious associations from which Methodism sprang. The intercourse of the brothers Wesley at this time with William Law, the author of the "Serious Call," had a great influence on their opinions and conduct. They walked two or three times a year from Oxford to visit Law at his house near London. In 1735, John W. was induced to go out to Georgia with General Oglethorpe, to preach to the Indians and colonists. His religious views at this time were strongly tinged with asceticism. His intercourse with Moravians, who were his fellow-passengers to America, and afterwards his fellow-labourers in the colony, tended to stimulate his religious zeal. He attempted to establish a discipline in the colony, very different from that of the Church of England at home, and failed in the attempt. The difficulties of his position were increased by an affair in which he became involved with the daughter of the chief magistrate of Savannah, whom he wished to marry; but on the advice of the Moravian bishop and elders, to whom he submitted the matter, he withdrew from her, and she very soon marrying another, W. refused her admission to the communion; upon which her husband raised an action at law, and W., finding Savannah no suitable place for him, and, as he said, "shaking the dust off his feet," returned to England, having resided in America not quite two years. With religious zeal undiminished, he maintained an intimate connection with the Moravians in London. On 24th May 1738, some months after his return to England, he attended a meeting of a society in Aldersgate Street, where, whilst one was reading Luther's preface to the Epistle to the Romans, he experienced such a change of religious feeling that, notwithstanding all his previous zeal, he ever afterwards regarded this as the time of his conversion. "I felt my heart strangely warmed," he says; "I felt I did trust in Christ, Christ alone, for salvation; and an assurance was given me, that He had taken away my sins, even mine, and saved me from the law of sin and death." Many who accept generally Wesley's views of conversion, doubt his opinion as to the date of his own. After this, he visited the Moravian brethren at Herrnhut in Germany, made the acquaintance of Zinzendorf, and was introduced to the Prince Royal of Prussia, afterwards Frederick the Great. Returning to England, he became associated with his old college companion, Whitefield, and after his example began, in 1739, the practice of open-air preaching. From this time, the history of Wesley's life becomes very much the history of Methodism. In 1740, he solemnly separated himself from the Moravians, finding that he differed from them on important points of doctrine; and in the same year the breach took place between Whitefield and him, which divided the Methodists in two sections, Calvinistic and Arminian. In the evangelistic work which he carried on in England, and in organising the Methodist body, W. was indefatigable. He seldom travelled less than forty miles a day, usually on horseback, till near the close of his life, when he used a chaise. In 1758, he married a widow with four children, but the marriage proved an unhappy one, and a separation ensued. His health gradually declined during the last three years of his life, and after a short illness, he died in London, 2d March 1791, in the 88th year of his age. His remains lay in state for several days in his chapel in the City Road, dressed in the sacerdotal robes which he usually wore, with a Bible in his hand. W. was a voluminous writer. His writings are chiefly polemical and religious. His style in the pulpit was fluent, clear, and argumentative, not impassioned like Whitefield's; his countenance was mild and grave; and his manners agreeable, although he exercised a very imperial domination over the preachers of the Methodist body. He was a man of great benevolence, and gave away all his living to the poor. Probably no man ever exerted so great an influence on the religious condition of the people of England as John W., and his influence has extended to the most remote parts of the world.—CHARLES WESLEY, his younger brother, born at Epworth, 18th December 1708, was associated with him in the whole Methodist movement. Having studied at Christchurch, Oxford, and visited Georgia at the same time with his brother, he took an active part in the subsequent work in England. He was a clear and simple preacher, and a man of fervent piety, but of a disposition very far removed from asceticism. He is the author of a great number of hymns in use among the Methodists; some of which, however, are among the best and most admired hymns in the English

language, replete with pious feeling, and of lyrical power and sweetness almost unsurpassed.—See “The Works of the Rev. John Wesley” (16 vols., Lond. 1809); “Life of the Rev. John Wesley, A.M., by Dr. Coke and Mr. Moore (Lond. 1782); and “The Life of Wesley, and the Rise and Progress of Methodism,” by Southey (2 vols., Lond. 1890; new edition in Bohn's Standard Library, Lond. 1864).

WESSEL, Johann, called also *Gansfort*, a predecessor of Luther, was born at Gröningen, 1419, taught philosophy at Cologne, Louvain, Heidelberg, and Paris, and died (1459) in his native town. On account of his learning, he was called *Lux Mundi* (Light of the World); while his enemies, on account of his opposition to the scholastic philosophy, termed him *Magister Contradictionum* (Master of Contradictions). In his doctrine of justification by faith, he forestalled Luther, who esteemed him very highly. After his death, a large portion of his writings were burned as heretical. Another portion appeared under the title of “*Farago Rerum Theologicarum*,” of which Luther published an addition with a preface (Wittenb. 1522), but the most complete edition is that by Joh. Lydus (Amst. 1617). See Ullmann's “Joh. Wessel, ein Vorgänger Luther's” (Hamb. 1834), and Bähring's “Das Leben Joh. Wessel's” (Bielef. 1846).

WESSEX. See HEPTARCHY.

WEST, Benjamin, Anglo-American painter, was born at Springfield, Pennsylvania, October 10, 1758, of Quaker parentage, and with lack of opportunity or encouragement, surprised his friends by his skill in drawing at the age of seven years, and at nine painted a picture in water-colors, which, in some points, he declared in after-life, he had never surpassed. His first colors were made from leaves, berries, &c., and his brushes stolen from a cat's tail. Thus self-taught, at the age of 16 he practised portrait-painting in the villages near Philadelphia, and painted for a gunsmith his first historical picture, “The death of Socrates.” While the Society of Friends were discussing the propriety of his becoming a painter, he shocked their principles still more by volunteering in a military expedition to search for the remains of Braddock's army. At 18, he was painting portraits in Philadelphia, and later at New York, where, in 1760, he was aided by some generous merchants to go and pursue his studies in Italy. At Rome, he was patronised by Lord Grantham, whose portrait he painted, became the friend of Mengs, and, as the first American artist ever seen in Italy, attracted much attention. He painted his “Cimon and Iphigenia,” “Angelica and Medora,” and was elected member of the academies of Florence, Bologna, and Parma. In 1763, visiting England on his way to America, he was induced to remain in London, and in 1765 married Eliza Shewell, to whom he had been engaged before leaving America. His “Agrippina landing with the Ashes of Germanicus,” attracted the attention of George III., who was his steady friend and patron for forty years, during which time he sketched or painted 400 pictures. His “Death of General Wolfe,” painted in the costume of the period, against the advice of all the most distinguished painters, effected a revolution in historic art. For the king he painted a series of 28 religious pictures for Windsor Castle. His best-known works are “Christ healing the Sick,” “Death on the Pale Horse,” and the “Battle of La Hague.” In 1792 he succeeded Sir Joshua Reynolds as the President of the Royal Academy, but declined the honor of knighthood. Through his whole career, he was the generous friend, adviser, and patron of young artists. “The Life and Studies of Benjamin West” were compiled from materials furnished by himself, by John Galt, in two parts (Lond. 1816–1820); and a biography of him is also given in Cunningham's “Lives of Eminent British Painters.” He died in London, March 11, 1820, and was buried with great pomp at St. Paul's Cathedral. His wife died 1817. Two sons survived him.

WEST BROMWICH, a large and rapidly increasing town of South Staffordshire, one of the most important towns in the great manufacturing and mining district known as “The Black Country,” five miles north-west of Birmingham. A few years ago, W. B. was a mere village on a barren heath, and it owes the rapidity of its growth mainly to the rich mines of coal and iron in the vicinity, and to the industries to which these give rise. Very many canals, and three railways, run through the parish. There are numerous churches, schools, and other important establishments. There are very large glass-works and also gas-works in the town: much of the gas

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used in Birmingham, as well as all that supplied to W. B. Wednesbury, and many other towns in the vicinity, being made here. The manufactures of iron wares of all kinds, as gun and pistol barrels, locks, swords, fire-irons, fenders, &c., and of all kinds of hollow wares, as kettles, sauce-pans, &c., are among the great branches of industry. Pop. (1871) 47,981.

WESTBURY, a small and ancient parliamentary borough of Wiltshire, 20 miles north-west of Salisbury, and on the western declivity of the Salisbury Plain. Its church, a tasteful edifice, was erected—the older parts at least—in the 13th century. For the most part uninteresting in itself, W. stands in the midst of a locality interesting from its many antiquities. W. is a station on the Wiltshire and Somerset Railway. Pop. (1871) 6396, chiefly employed in agriculture, the manufacture of woollen cloth of a superior quality, and the smelting of iron ore, some extensive mines of which have lately been discovered near the town, and which afford employment to many hands.

WESTCHESTER, a beautiful town in a rich agricultural district of Pennsylvania, U. S., 23 miles west of Philadelphia, with elegant residences, a granite courthouse, a white marble bank, 10 churches, an academy, a State normal school, and 2 public libraries. Pop. (1870) 5630; (1880) 7,046.

WESTERN AUSTRALIA, a British colony, and the western section of the great island-continent of Australia, embraces the whole of that island west of the 129th meridian. Its extreme length from north-east to south-west is 1370, its average breadth is 650 miles, and its area is estimated at 978,000 sq. miles. Pop. (1871) 24,853, of whom 14,943 were males, and 9410 females. Revenue (1874) £148,072; expenditure, £148,266. This colony was formed in 1829, and in 1851 had only 5836 inhabitants; but within recent years a considerable number of emigrants have been sent out under the auspices of the Government Emigration Board. W. A. was formerly named *Swan River Settlement*, from the river Swan, which joins the Indian Ocean, after watering a considerable district in the extreme south-west. Of the whole vast area, this district in the south-west is now, as formerly, the only portion inhabited. There, mountain-ranges rising in elevation from the coast inland, run parallel with each other from south to north; the highest summit being 5000 feet above sea-level. The climate is agreeable and salubrious; the soil, both on the coast and in the interior, is light and dry. Bands of fertile land, where the sandalwood and other trees grow abundantly, and which are suitable for the culture of the vine, olive, and fig, occur in the middle districts of the country. Rivers, of which the Swan is the chief, abound; but are not of much use for navigation. Magnetic iron ore, lead, copper, and zinc ores are found in large quantities, and a little coal has been found. In 1874, 144 vessels, of 65,351 tons, entered the ports. There is a pearl-fishery on the n.-w. coast, producing to the value of £74,000 in 1874. Imports in 1874 (chiefly groceries, beer, ironmongery, and clothing, amounted to £367,418; exports (chiefly wool, sandalwood, timber, copper ore, and horses), £293,901. The capital is Perth, and there are several smaller towns. The colony became (1849), at the request of the colonists, a settlement for convicts, and has much benefited by their labor, a great extent of road, and many public buildings having been constructed by them. In 1863, the home authorities were, however, persuaded by the Australian colonists finally to discontinue transportation to Western Australia.

WEST INDIES are already described under **ANTILLES** (q. v.). See also the names of the islands themselves—Jamaica, Cuba, Martinique, &c.; as well as the European countries that possess them—Great Britain, Spain, France, Netherlands, &c.

WESTMACOTT, Sir Richard, R. A., an eminent sculptor, the son of Richard Westmacott; also a sculptor in his day of some little note, was born in London in 1776. His predilection for art was early manifested, and was carefully cherished by his father. He received as a youth the best education which London could then furnish, and in 1793 he proceeded to Rome to complete his studies. Here he became in some sort a pupil of the celebrated Canova, who shewed him much kindness and attention. His progress was rapid, and he distinguished himself by carrying off the highest prizes offered to the competition of the rising geniuses of the day, in particular a gold medal given by the Pope. In 1797, having, meantime, in recognition

of his talent and promise, been elected a member of the Academy of Florence, he returned to London, where, shortly after, he was married to a daughter of a Dr Wilkinson, then of some medical celebrity. His success in his art was not for a moment doubtful, and very soon he found himself in full employment. In 1805 he was elected an Associate of the Royal Academy; in 1810 he was advanced to the full dignity of Academician; and in 1835 the University of Oxford recognised his eminence by conferring upon him the honorary degree of D.C.L. Two years afterwards, the honor of knighthood was bestowed on him. Previously, in 1827, he had succeeded Flaxman as Professor of Sculpture at the Academy, in which capacity he continued to officiate till his death, which took place on September 1, 1856. The works of Sir Richard W. by which he is chiefly known are public monumental statues, in some of which he had much success. Of these it may suffice to mention his statues in Westminster Abbey of Pitt, Fox, Perceval, and Addison, with the monuments to Sir Ralph Abercromby and Lord Collingwood in St. Paul's Cathedral. Many of his works in the antique classical manner, are also of exquisite beauty and finish.

WESTMACOTT, Richard, R.A., son of the foregoing, was born in London in 1799. After being carefully educated under his father in the art which might seem to run in the family blood, he was sent to Rome in 1820 to prosecute his studies further. In Italy he passed six years; and after his return to London, he gradually won a reputation for himself as one of the ablest sculptors of the day. Besides being eminent in his art, he likewise made himself known as a man of considerable literary and general attainment; and in 1837 he had the honor to be elected a Fellow of the Royal Society. In the year following, the Academy recognised his more special claims by assuming him as an Associate; and in 1849 he attained the rank of Royal Academician. On the death of his father, he was appointed to succeed him in the Professorship of Sculpture, a post which he filled with distinguished ability and acceptance. He died in 1872.

WESTMEATH, an inland county of the province of Leinster, Ireland, bounded on the n. by the counties of Cavan and Meath, on the e. by Meath, on the s. by the King's County, and on the w. by Roscommon. It lies between n. lat. 53° 8' and 53° 48'; and w. long. 6° 54' and 7° 55'. Its greatest length, n. and s., is 85 miles, and the greatest breadth is 25 miles; the total area being 708 miles, or 453,468 acres, of which 365,218 are arable, 56,399 uncultivated, 8803 in plantations, 623 in towns, and 22,427 under water. The population in 1851 was 111,109; in 1861, 90,879; in 1871, 78,432, of whom 71,765 were Catholics, 5997 Protestant Episcopalians, and the rest Protestants of other denominations. The surface is for the most part level, the hilly district, which is in the north of the county, not reaching at any point a higher elevation than 710 feet. Nevertheless, owing to the number of lakes, and the large extent of wood in some districts, the scenery is in many places highly picturesque. Geologically, W. belongs to the great central limestone series; yellow sandstone only occurring in two very limited districts. Of the numerous lakes which diversify the surface, one chain belongs to the basin of the Shannon, which river, with its lakes, forms the western boundary, and separates W. from Roscommon; the other, towards the east, flows into the basin of the Boyne. The Shannon is navigable for steamboats throughout that portion of its course which bounds this county; and the inland navigation is further provided for by the Royal Canal, which traverses W. from east to west, and by a branch of the Grand Canal. The county is also traversed by the Midland and Great Western Railway. The climate is mild and not very moist. The soil is a deep loam, producing herbage especially suited to the fattening of cattle, which are largely fed; sheep also are fed, but not in the same proportion: as are also horses and pigs. There is little tillage, and almost the only cereal crop is oats. The total acreage under crops of all kinds in 1875 was 99,408, of which only 141 were in wheat; 26,500 acres were in oats, 11,991 in potatoes, 6667 in turnips, 51,619 in meadow and clover. The quantity under other green crops than turnips and potatoes was small, and only 90 acres were in flax. On the other hand, the total number of cattle was 96,802, of sheep 161,034, of horses 11,883, and of pigs 19,154. The net annual value of property under the Valuation Act is £314,701. W. is divided into twelve baronies. The chief towns are the assize town and capital, Mullingar (q. v.), Moate, and Athlone, which is partly in the county of Roscommon. It returns three members to the imperial parliament, two for the

county and one for the borough of Athlone. The constituency in 1875—1876 numbered 3552. The number of pupils at the national schools in 1875 was 16,972. W. anciently formed a portion of the kingdom of Meath (q. v.), but in the 84th of Henry VIII., it was erected into a separate county, and at first included Longford (q. v.) and part of the King's County (q. v.). Many antiquities of the Anglo-Norman period, and some of the Celtic, chiefly tumuli and raths, are found in this interesting and picturesque county.

WESTMINSTER. The City and Liberty of, now forms part of the English metropolis. It is bounded by Temple Bar on the east, the Thames on the south, Chelsea and Kensington on the west, and Marylebone on the north. The early history of W. is that of the abbey, still the most interesting of its public buildings. In early times, that part of W. which adjoins the Thames was surrounded by a branch of the river, so as to form an island called Thorney Island, from its being covered with brushwood. Here, on the site of the present abbey, Sebert, king of the East Saxons, is said, in the 7th c., to have built a church. It is supposed to have been replaced by an abbey called Westminster, to distinguish it from the cathedral church of St Paul's, called originally Eastminster. The first edifice erected on the site, of which we have any certain account, was one built of stone by Edward the Confessor in 1065. The Pyx House, a low apartment, 110 feet long by thirty feet wide, vaulted and divided by a central range of eight plain pillars with simple capitals, is nearly all that remains of it. The principal parts of the existing abbey were built by Henry III. In 1220 he erected a chapel dedicated to the Virgin, and a quarter of a century later he took down the old abbey of the Confessor, and erected the existing choir and transepts, and the chapel of Edward the Confessor. The remainder of the building was completed under the abbots, the western parts of the nave and aisles having been erected between 1340 and 1433. The west front and its great window were the work of Richard III. and Henry VII. The latter pulled down the chapel to the Virgin, erected by Henry III. at the east end of the church, and built the chapel known as Henry VII.'s chapel. This completed the interior of the abbey as it now stands; the only important addition made since then having been the upper parts of the two western towers, which were the work of Sir Christopher Wren. The whole building forms a cross. Its extreme length, including Henry VII.'s chapel, is 511 feet; its width across the transepts is 203 feet. The width of the nave and aisles is 79 feet; of the choir, 38 feet; and of Henry VII.'s chapel, 70 feet. The height of the roof is 102 feet, a loftiness unusual in English churches. It is the interior of the abbey which has at all times excited the most enthusiastic admiration. The harmony of its proportions, and the "dim religious light" of the lofty and long-drawn aisles, leave on the mind impressions of grandeur and solemnity which churches of greater size fail to produce. The abbey was at one time the burying-place of the English kings, and it has become a national honor to be interred within its walls. It is crowded with tombs and monuments. The chapel of Edward the Confessor, at the east end of the choir, contains his shrine erected by Henry III., the altar tombs of Edward I., Henry III., Henry V., and Edward III. The canopy of that last mentioned deserves especial notice. It is considered to be one of the greatest works in wood extant, and equal to anything in the best age of mediæval art. Against the altar screen in this part of the church stand the two coronation chairs. One, the king's chair, encloses the stone brought by Edward I. from Scone, on which the Scotch kings were crowned. The other, the consort's chair, was constructed for the coronation of Mary, wife of William III. Both are still used at coronations. Most of the English kings, from the time of Henry VII. down to that of George III., were buried in Henry VII.'s chapel, and there accordingly are the tombs of Queen Elizabeth and Mary Queen of Scots. The most remarkable monuments in other parts of the church are those in the east aisle of the southern transept, known as "Poets' Corner," where many of the most eminent British poets have been buried. There monuments are erected to Chancer, Beaumont, Drayton, Cowley, Dryden, Milton, Gray, Prior, Shakespeare, Thomson, Gay, Goldsmith, Addison and Ben Jonson. In the north transept are the monuments of Pitt, Fox, Chatham, Canning, and Wilberforce. Elsewhere are the monuments of the great engineers and inventors, Telford, Watt, and Stephenson.

Since Dean Stanley (q. v.) became connected with the abbey in 1864, much has

been done to restore and improve the interior, and services conducted in have attracted much public interest; more especially the anniversary of the foundation, celebrated on 28th December 1865, and the mission sermon delivered by Professor Max Müller on 3d December 1878, when the dean of an abbey asserted his right to allow a layman to preach there.

South of the Abbey are the Pyx House, chapter-house—since 1866, restored under the direction of Sir Gilbert Scott—cloisters, and the building occupied by W. School, formerly the monks' dormitory, &c. W. School was founded by Queen Elizabeth for the education of 40 boys known as Queen's scholars, who are prepared for the universities. Other persons send their sons to it, and it has long been one of the leading English public schools.

The city of W. sprang up round the abbey, and the English kings, in consequence of the jealousy with which they regarded the privileges claimed by the citizens of London, early took up their abode there. Before Edward the Confessor began to build his new church at Westminster, the residences of the English kings had been the Roman fortresses in London, or the Saxon city of Winchester. The king, to superintend the building of the church, took up his abode in the palace. William Rufus, in 1097, erected a palace between the abbey and the Thames. Its chief apartment was a banquetting-hall, which, becoming ruinous in the time of Richard II., he pulled down, and erected in 1397—1399, on the same site, and indeed on the same foundations, the great hall which still exists. It is 90 feet high, and 200 feet long, by 68 feet wide internally, and is roofed by 13 great ribs of timber, combined with a mechanical skill which has not been excelled in any work of the present age. The roof of Westminster Hall is the finest specimen of the purely English art of forming a Gothic roof of wood; with the exception, perhaps, of the Hall of Justice at Padua, it is the largest roof in Europe unsupported by pillars. The law courts were established at the hall in 1234, and they continue to be held in buildings which rest on the northern side of the building, and open into it by side doors. These law-courts, as an excrescence and out of place, are to be removed to the new buildings about to be erected near Lincoln's Inn Fields.

The old Houses of Parliament which adjoined the hall, and like it lay between the abbey and the Thames, were burned to the ground in 1834. It was then determined to erect a new building on the same site, but on a much grander scale. The designs of Sir Charles Barry for "the New Palace of Westminster" were selected as the best, and the work was begun in 1840. The building is the most magnificent erected in this country for many centuries. It may be roughly said to form a parallelogram, 900 feet long by 800 feet in width. The principal rooms are the House of Lords and the House of Commons, which occupy the centre of the building, and run on the line of its greatest length. They are separated by an "Octagon Hall," with a diameter of 70 feet between the walls. From this hall, one corridor runs north to the House of Commons, and another south to the House of Lords, beyond which are the royal apartments at the extreme south of the building. The entrance to the "Octagon Hall" is by a passage known as St Stephen's Hall, which communicates by flights of steps with an entrance in the east front, and also with Westminster Hall, which, included in the new building, forms its northern vestibule. The state entrance of the queen is at the south-western extremity, and is, of course, in direct communication with the royal apartments. The building is surmounted by lofty spires and towers. In the centre, above the Octagon Hall, rises the central tower, 300 feet high. At each corner there are towers; at the south-west the Victoria Tower, 346 feet high; at the north-west the clock-tower, surmounted by a belfry spire 320 feet high. The clock has four faces, each 90 feet in diameter; and it strikes the hours on a bell weighing 9 tons, and known as Big Ben. The appearance of the eastern front is still marred by the buildings occupied as law courts, and it is believed that, on their removal, the picturesque outline of the palace, seen from the north-east, will for the first time prove all the merit of the architect's designs. The chief subject of regret in connection with the edifice is, that the stone of which it was built, a magnesian limestone from Yorkshire, has rapidly decayed, and that it has, in consequence, been found impossible to protect the rich ornaments of the exterior from the influence of the atmosphere. Many public improvements have been carried out recently in W., the chief being the construction of the Thames embankment, opened 18th July 1870, which forms a broad and magnificent thoroughfare between the Houses of

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Parliament and Somerset House; and the erection of the India and Foreign Offices at the easterly extremity of St James's Park, and thrown open to parliament in December 1873.—See "Historical Memorials of Westminster Abbey," (3d edition, Lond. 1869); "Dedication of Westminster Abbey," by Dean Stanley; "The Memorials of Westminster," by Rev. Mackenzie E. C. Walcott (1881).

WESTMORELAND, a county in the north-west of England, bounded on the e. by Yorkshire, on the s. and w. by Lancashire, and on the n. by Cumberland and Durham. Area, 500,906 acres, of which there were in 1876, 20,500 acres under corn crops, 10,518 under green crops, 17,626 clover and other grasses, 199,596 of permanent pasture. There were in the same year 7879 horses (used for agricultural purposes), 57,703 cattle, and 331,324 sheep. Pop. (1871) 65,006. The surface is almost wholly mountainous, the chief summit being Helvellyn (8055 feet), partly in Cumberland. The other more important summits are Loughrigg Fell, Bowfell, Crosefell, and High Street and Langdale Pikes. Lakes remarkable for their beauty occur. The chief are Windermere (q. v.), partly belonging to Lancashire; and Ullswater (q. v.), between W. and Cumberland. Moorlands are numerous and extensive; but along the courses of the Kent in the south, and the Eden in the north—the principal streams—there are tracts of fertile land. The climate is mild and moist, often with much snow in winter, the deep wreaths of which frequently prove fatal to travellers on the mountain tracks. The soil is mostly a dry gravelly mould, favorable to the culture of turnips, of which great crops are produced. Rich pasture-lands abound, and cattle, mostly of a large size, are extensively reared. The county town is Appleby, and the other chief towns are Ambleside, Kendal, and Kirkby-Lonsdale. The county returns two members to parliament.

WESTPHALIA, a province of Prussia, lies between Holland, Hanover, Brunswick, Hesse-Nassau, and the Rhine Province. Its area is 7770 English sq. m., with a population (1875) of 1,907,195, who, with the exception of about 18,000 Jews, are of the purest German descent. Of the population, 949,118 were, in 1871, Catholics, and 806,464 Protestants. W. is divided into three districts—Münster in the north-west, Minden in the north-east, and Arnsberg in the south. The east of the province presents vast plains covered with grain, while the north-west exhibits an uninterruptedly flat expanse of uncultivated land. The climate is generally temperate. The chief rivers are the Weser (q. v.), the Ems, the Lippe, and the Ruer, or Ruhr, each of which is navigable for a considerable part of its course. The prosperity of W. is chiefly due to its flax crops and its mineral treasures, especially coal and iron. The chief of the industrial products are iron, and articles of iron, steel, and copper from the forges of Arnsberg; while manufacturing industry embraces flax-spinning and linen-weaving in Minden, and extensive production of woollen articles, stockings, and ribbons of esteemed quality. The exports consist of these products, and of meat, especially hams. The capital, Münster (q. v.), had, till 1818, a university, now a higher academy, and is the seat of the supreme Catholic and Protestant religious authorities.—W. derives its name from the West-falen, a section of the great Saxon people, who migrated hither from the banks of the Elbe after the Christian era; and after the subjugation of the Saxons by Charlemagne, the deposed leader, Wittekind, was allowed to remain *Duke of the Engern and West-falen*. At this time, the country called W. (and occasionally denominated *Sauerland*) comprised all Germany between the Weser, Rhine, and Ems; and soon after, it was subjugated by the dukes of Lower Saxony, and held by them till, on the rebellion of Henry the Lion in 1179, the electoral archbishop of Cologne extended his sway over it. It then became one of the circles of the empire, and belonged to the Cologne electorate till 1802, when most of it was given to the Hesse-Darmstadt family. In 1807 arose the *kingdom of Westphalia*, which, besides a portion of W., also included Electoral Hesse, Hanover, Brunswick, and portions of Upper Saxony. This kingdom, erected by Napoleon as a preliminary to its incorporation into France, was given to his youngest brother, Jerome, who made Cassel his capital, and, despite the large French garrisons with which the country was burdened, and the extensive contributions in men and money which it was forced to pay to Napoleon, succeeded, by the establishment of the Code Napoleon, and by shewing in various other ways his strong desire to promote the welfare of his new subjects, in acquiring their esteem. But the oppressive conscriptions and taxes for the behoof of the French army and treasury gradually in-

creased in amount, and excited such resentment, that Jerome's life was several times threatened. The king repeatedly remonstrated with Napoleon, but without the slightest effect; and despite his efforts, the "continental system" was introduced into his states. In 1813, Jerome was chased from Cassel by the Russians; and though he returned for a few days, the defeat of Leipzig forced him to take shelter in France. By the treaty of Vienna, the states which had been joined to W. to form the kingdom, were restored to their former possessors, and W. itself, with the exception of a portion which had been annexed to Hesse-Darmstadt, was united to Prussia.

WESTPHALIA. Treaty of, also known as the "Treaty of Munster," was concluded at Munster and Osnabruck (towns in the circle of Westphalia) in 1648, and in putting an end to the Thirty Years' War (q. v.), restored tranquillity to Germany, established a new system of political equilibrium in Europe, and became the basis of all subsequent treaties down till the French Revolution. The minor states of Germany had long desired a cessation of hostilities; and as early as 1638, plenipotentiaries from France, Sweden, and the Empire had assembled at Hamburg; but it was not till several years after, that all parties agreed to Munster and Osnabruck as the places, and to March 24, 1648, as the time of meeting of the congresses. Ferdinand, however, was very loath to commit himself to a definite negotiation till the success of his arms, the hope of succor from Spain, or a change in the French policy, should give him less the position of a beaten opponent willing to accept almost any terms; and he accordingly temporized from time to time till his hopes of succor had vanished. In 1644, the congresses opened; the two places of meeting having been chosen to avoid any rivalry between France and Sweden for supremacy, to prevent any collision between the Swedish representatives and the pope, and to separate the Catholics from the Protestants. The representatives of France, the Empire, Spain, and the Catholics of Germany, met at Munster under the mediation of the pope, and those of Sweden, the Empire, and the Protestants of Germany under the mediation of the king of Denmark; the representatives of Spain, Portugal, the United Provinces, Savoy, Tuscany, Lorraine, Mantua, and Switzerland being also present: so that this congress included all the great European powers except Britain, and almost all the minor powers. As the conflict was still carried on with undiminished vigor, the inclination of fortune to one side was the signal for excessive demands, which were met on the other side by evasive proposals; and it was not till Torstensson's decisive campaign of 1644-1645 that negotiations commenced in earnest, and the representatives made specific propositions. The successes of Turenne and Wrangel in Southern Germany, and the capture of Prague by the Swedes under Königsmark in July 1648, at length overcame all the emperor's dilatoriness, and the Osnabruck representatives having arrived at Munster a few days before, the treaty was finally signed at Munster, 24th October 1648. Its terms, as regards the Germanic Empire, were as follows: The sovereignty and independence of the different states of the empire were fully recognised, and liberty was given them to contract any alliances with each other, or with foreign powers, if these were not against the emperor or the empire; all religious persecution in Germany was forbidden; the treaty of Passau and the religious peace of 1555 were confirmed; and with respect to the secularisation of ecclesiastical benefices, everything was to remain in Austria as it was in 1624 (hence called the *normal year*), and in the Palatinate, Baden, and Wurtemberg as it was in 1618; the power of putting under the ban of the empire was only to be exercised with consent of the diet; and the Reformed were put on a footing of equality as to privileges with the Lutherans. The territorial changes were as follows: the Lower Palatinate was restored to the eldest son of the unfortunate "Winter King" (Frederick V., Elector Palatine), and an eighth electorate was created in his favor, but the Upper Palatinate and Chm were given to Bavaria, on condition that, should the two states become united, one electorate was to be abolished (as happened in 1777, see **BAVARIA**); part of Alsace was ceded to France; Upper Pomerania, Rugen with Stettin, Gartz, Damme, Gollan, the Isle of Wollin, Peine, Schweine, and Divenan in Lower Pomerania, Wismar, the secularised archbishopric of Bremen as a duchy, and the bishopric of Verdun as a principality, were obtained by Sweden as fiefs of the empire, with three deliberative voices in the diet, and an indemnification of 5,000,000 crowns to be paid by the empire; Brandenburg obtained, as compensa-

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tion for its cessions in Pomerania, the secularised archbishopric of Magdeburg as a duchy, and the bishoprics of Halberstadt, Minden, and Camlin; Hanover and Mecklenburgh were compensated for their share in these cessions by secularisation church lands; and Hesse-Cassel obtained the rich abbacy of Hirschfeld, with 600,000 thalers. The independence of the United Provinces was recognised by Spain, and that of Switzerland by the Empire. The pope's agent, Fabio Chigi (afterwards Pope Alexander VII.), protested vigorously against the liberal alienation of the possessions of the Church, and withdrew; and the king of Denmark's mediation being stopped by his war with Sweden in 1644, the treaty was concluded under the sole mediation of the Republic of Venice, and France and Sweden became guaranties for its execution. France, Sweden, and the Protestants were the only gainers by this treaty, which, by weakening the great central authority of the empire, destroyed its unity, allowed France, as one of the guaranties, a pretext for continual interference with its internal affairs, and gave the *coup de grâce* to the independence of the remaining free cities of the empire.

WEST POINT, site of the United States Military Academy, and of a fortress erected during the War of Independence, on the right bank of the Hudson River, 52 miles north of New York. The Military Academy is on a plain, 160 to 180 feet above the river, surrounded by the bold scenery of one of the finest river-passes in the world. The forts and a river chalu were taken by the British in 1777, but abandoned after Burgoyne's surrender, and stronger forts were built, which General Arnold bargained to betray—a plot foiled by the arrest of Major André. The academy was established in 1802, for 40 cadet artilleryists and 10 engineers. The number was increased, in 1808, to 156; in 1812, to 260. It is governed by a board of five visitors and a staff of 61 professors and teachers. The education is free—each pupil engaging to serve eight years. Each member of congress has the right to nominate one cadet from his district, and ten are appointed by the president. The course of study and discipline is four years: (1) mathematics, engineering, fencing, bayonet-exercise, school of the soldier; (2) mathematics, French, fencing, tactics of infantry, artillery, and cavalry; (3) natural philosophy, chemistry, drawing, riding, tactics; (4) military and civil engineering, mineralogy, geology, chemistry, law, literature, practical military engineering, tactics.

WESTPORT, a small seaport town of Cunnought, Ireland, county Mayo, stands in a pretty valley at the mouth of a small stream that falls into Clew Bay, about 85 miles north-north-west of Galway. Formerly W. was supported principally by linen manufactures; but it is now known mostly for its trade in corn and provisions, and for its facilities for sea-bathing. In the immediate vicinity is the Reek, a mountain 2510 feet high, from which magnificent views of the coast and neighborhood may be obtained. In 1875, 99 vessels, of 14,187 tons, entered, and 70, of 16,144 tons, cleared the port. The population was (1871) 4417.

WEST PRUSSIA. See PRUSSIA, PROVINCE OF.

WESTSTEIN, the name of a Swiss family illustrious for the talents and learning of its members, originally from Kyburg, in the canton of Zurich. Among the more noteworthy are—(1) **JOH. JAKOB W.**, born at Basel in 1594, who was first in the service of the Venetian state. In 1620 he became a member of the Supreme Council of his native town; represented Switzerland at the Peace of Westphalia (1648); was raised to the rank of a noble in 1658, and died in 1666.—(2) **JOH. RUD. W.**, son of the preceding, was born at Basel in 1614, and died there in 1683, professor of theology. He was a great opponent of the introduction of the "Formula Consensus," and assisted Suicer in drawing up his "Thesaurus Ecclesiasticus."—(3) **JOH. RUD. W.**, son of the preceding, born at Basel in 1647, and died there in 1711; also professor of theology, favorably known as an early editor of Origen.—But the most distinguished member of the family is **JOH. JAKOB W.**, son of Joh. Rud. W., the younger, who was born at Basel, 6th March 1693. After a thorough study of the classics, Hebrew, philosophy, and mathematics, he was made a Ph.D. at the age of 16. Four years later, he became a minister, and gave himself up to the study of the New Testament. In 1717, he began to give lessons in theology at the university of Basel, and continued to do so until 1780, when (being suspected of Socinianism) he was forced to leave Switzerland. He

sought an asylum in Holland, where the Remonstrants appointed him professor of theology at Amsterdam in 1738. He died there 28d March 1764. W.'s great work is his edition of the New Testament, with prolegomena, a collection of various readings, and Latin notes (3 vols., Amat. 1751—1752). Its publication marks an epoch in the history of New Testament criticism. Semler reprinted the prolegomena with additions (Halle, 1764).

WETTE, Dr. See Dr WETTE.

WETTER, Lake, after Lake Wener (q. v.), the largest lake in Sweden, lies in Gothland, about 25 miles south-east of Lake Wener in direct line. It is 70 miles long, 13 miles in average breadth, has an area of 850 sq. m., is 370 feet in greatest depth, and is 800 feet above the level of the Baltic. It receives about 90 small tributaries, though its waters have only one outlet, the Motala River, which, flowing eastward, maintains the communication of the lake with the Baltic. Its waters are clear, and of a beautiful green color, and it is surrounded by lofty romantic shores, almost unbroken by bays. It is remarkable for an irregular alternation of risings and fallings, and for an occasional undulation, which is so rapid and violent as to break the thick sheet of ice with which it is covered in winter. An intricate chain of small lakes, continued westward by the Göta Canal, connects Lake W. with Lake Wener, and thence with the Cattegat. Lake W. contains few islands, and of these the chief is Wisingsö, 7 miles long by $1\frac{1}{2}$ mile broad.

WETTERHORN (Peak of Tempests), a lofty mountain of the Bernese Oberland, Switzerland, on the east side of the Grindelwald, and about 10 miles south-east of the Lake of Brienz. From the path by which it is ascended, it rises in one vast precipice of alpine limestone, seeming to threaten the traveller. The three peaks of the W. are respectively 12,149, 12,166, and 12,107 feet high.

WETZLAR, a small town of Rhenish Prussia, charmingly situated on the Lahn, 40 miles north of Frankfurt-on-the-Maine. Part of its old cathedral is said to date from the 11th century. W. is notable as the scene of the "Sorrows of Werther." Pop. (1871) 6180.

WEXFORD, a maritime county of the province of Leinster, Ireland, is bounded on the n. by the county of Wicklow, on the e. by the English channel, on the s. by the Atlantic, and on the w. by the counties of Waterford, Kilkenny, and Carlow. Its greatest length north and south is 55 miles, and its greatest breadth east and west is 34 miles. The total area comprises 900 sq. m., or 573,616 acres, of which 510,709 are arable, 45,501 uncultivated, 14,325 in plantations, 2393 in towns, and 8663 under water. Pop. (1871) 133,666, of whom 120,356 were Catholics, 11,296 Episcopalians, and the rest Protestants of other denominations. The coast-line of W., which extends from Kilmichael Point to the estuary of the Suir, Waterford Harbor, is irregular, and very dangerous for shipping. From the above-named Point to Wexford Harbor there is no opening for navigation; and as Wexford Harbor, besides being intricate and dangerous, is also obstructed by a bar, it offers little security in boisterous weather; but considerable improvements have lately been made. The coast from the southern headland of Wexford Harbor, Rosslare Point, to the mouth of the Suir, presents a succession of bays and headlands. The headland called Carnore Point is the south-eastern extremity of Ireland. Parallel with the northern coast-line, at a distance of a few miles, is a range of sandbanks; and the southern shores are beset by outlying rocks and islets, which, although somewhat guarded by light-houses and light-ships, frequently prove fatal to shipping. The greater part of the surface is tolerably level, but some detached hills rise to considerable elevation. The mountains of the border are much more elevated, the highest point of the Blackstairs being 2409 feet; and of Mount Leinster, 2610. There are few lakes, and these of small size. The principal river is the Slaney, which for some distance is the boundary between W. and Carlow, but enters W. near Newtownbarry, whence it flows by Enniscorthy into the sea in Wexford Harbor. In its geological structure, W. belongs to the eastern clay-slate tract, which stretches in a south-westerly direction from the north of Wicklow to the Atlantic, and which extends across the level districts as far as the granite range separating W. from Carlow. Granite is found in the south-east of the

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county, and in some of the detached hills, as are also beds of greenstone. Silver was formerly raised near a place called Clounilnes, where traces of an ancient mine are still seen, and galeua has been found in the same place. Copper ore is found at a place called Kerlogue, near W., and plumbago and asbestos near Ennisclorthy. The climate is said to be singularly temperate, and the district is more suitable for agriculture than the counties of Carlow and Kilkenny, although inferior in fertility. The total acreage under crops in 1875 was 228,916; of which 10,186 was under wheat; 50,165 oats; 68,818 barley; 3802 beans and pease; 26,081 potatoes; 18,783 turnips; 61,649 meadow and clover, and the rest minor crops; only 2 acres being under flax. The annual value of property in W., under the Valuation Act, is £374,671. There are but few and inconsiderable manufactures, and the trade is chiefly in the export of agricultural produce, especially barley; butter, cattle, pigs, poultry, and eggs are also exported in large quantities. The pupils at the national schools in 1875 numbered 14,754. W. is divided into ten baronies. Of these the barony of Forth is very remarkable as having preserved, from the 13th c. down to the very last generation, a dialect of English quite peculiar, as well as many peculiar usages and social habits. The principal towns are Wexford (q. v.), Ennisclorthy, New Ross, and Gorey; Newtownbarry and Taghmon have each a population of about 1000; and Duncannon is noticeable for its ancient fort and interesting historical associations. The maritime position of W. laid it open early to the incursions of the Danes, to whom the name Wexford, or Welseford, is traced by antiquaries. It was the first landing-place of the English in the invasion, and formed part of the tract granted to them by MacMurrough. By the marriage of Strongbow with Eva, MacMurrough's daughter, it came into his hands; and after the partition of his lands among his daughters at his death, W. underwent many changes of masters. During the civil wars which followed 1641, W. was the scene of frequent contests; and in the more recent insurrection of 1798, it formed the theatre of the only formidable conflicts of the peasantry with the regular troops. There are numerous relics of antiquity, Celtic as well as Anglo-Norman, in almost every part of the county. Upwards of a hundred castles are still traceable, and many ecclesiastical remains, of which the monasteries of Dunbrody, Tintern, Ross, and some others are not unworthy of the best days of mediæval architecture. W. returns four members to parliament, two for the county one for the borough of Wexford, and one for that of New Ross.

WEXFORD, capital of the county of that name, a seaport, and parliamentary and municipal burgh, is situated at the mouth of the river Slaney, 74 miles south from Dublin, with which it communicates by the Wicklow, Wexford and Waterford Railway, now completed. The pop. in 1871 was 12,077, of whom 11,194 were Roman Catholics, 717 Protestant Episcopalians, and the rest Protestants of other denominations. The town is situated on the south-western shore of the estuary of the Slaney, which is known as Wexford Harbor, and along which the quay extends nearly 1000 yards, forming a spacious and not inelegant terrace. Behind this the town extends in two nearly parallel streets. There are two Protestant and three Catholic churches. Of the latter, two are modern and handsome structures. One of the former, St Selsker's, is ancient, part of its walls dating from the English invasion. There are also a Presbyterian, a Methodist, and a Quaker meeting-house; a convent of Franciscan Friars, 5 nunneries, a Roman Catholic college, and National, Christian Brothers', and conventual schools. Besides the union workhouse, there are also an infirmary and a fever hospital. The only manufactures of any importance pursued are those of distillation and the grinding of corn; the chief industry of the town being in connection with the export trade of the county, already described. The position of W. for export trade, favorable in itself, is much marred by the shallowness and intricate character of the channel of the Slaney, which has the further disadvantage of being obstructed by a bar. Great improvements have been made, a patent slip and dock have been constructed, steamers are employed in the export of cattle and provisions, and an active shipping-trade is carried on. The W. fisheries also have long been reckoned among the most valuable on the eastern coast. The town is extremely ancient, and was occupied by the Danes as one of their strongest settlements. From the time of the invasion, it became an English stronghold against the native population. During the civil wars of 1641, it was occupied by the confederated Catholics, but was taken by Cromwell in 1644. The insurgents of 1798 also had possession of it for a short time. W. returns

one member to the imperial parliament. In 1875, 708 vessels, of 66,696 tons, entered, and 268, of 84,376 tons, cleared the port.

WEYMOUTH, a township of Massachusetts, U.S., on Boston Harbor, twelve miles south-south-east of Boston, on South Shore Railway, containing the four post-villages of Weymouth, East Weymouth, North Weymouth, and South Weymouth, with large factories of nails, boots and shoes, &c. Pop. in 1880, 10,570.

WEYMOUTH-AND-MELCOMBE-REGIS, a seaport, a fashionable watering-place, and a municipal and parliamentary borough of Dorsetshire, on a bend of the coast facing the south-east, and at the mouth of the river Wey, three miles north of the Isle of Portland, and eight miles south of Dorchester by railway, seven in a straight line. A projecting point, called the Nothe, separates the two quarters—the old town of Weymouth lying to the south of it, the modern town, Melcombe-Regis, extending to the north, and facing the sea. The two quarters communicate by means of a bridge with a swing in the middle, to permit the passage of ships. The old town is uninteresting in appearance; Melcombe-Regis, elegantly built, stands on a narrow peninsula, with the sea on the east, and an estuary on the west side. Its chief features are the sea-terrace and esplanade, the latter adorned with a statue of George III., who largely patronised Melcombe. The harbor has fourteen feet of water at full tide, and in the bay there is good anchorage in seven or eight fathoms. Portland Harbor, just recently completed, will be a source of great trade to the town. W.-and-M. is the seat of steam traffic to the Channel Islands. Ship-building, rope and sail-making, and the export of Portland stone and Roman cement, employ the great mass of the inhabitants. The town is connected with the Great Western and London and South-western Railways, and one connecting it with Portland Isle was opened in 1865. Pop. (1871) 18,259.

WHALE, the popular name of the larger cetaceans, particularly of all those belonging to the families *Balaenidae* and *Physeteridae* or *Catodontidae*. The latter family has already been noticed in the article *CACHALOT*, and some of the species of *Delphinidae*, also sometimes called whales, have been described in separate articles, as the *CARING WHALE* and the *BELUGA*. The *Balaenidae* alone remain to be described now. In this family, the head is of enormous size, as in the *Catodontidae*, but is entirely destitute of teeth, instead of which, the palate is furnished with an apparatus of *baleen*, or *whalebone*, for the purpose of straining out of the water the small crustaceans and scalefish, which form the food of these whales. Rudiments of teeth, however—dental pulps—appear in the fetus of the whale—sixty or seventy on each side of each jaw; but they are reabsorbed into the system, and the plates of whalebone are not produced from them, but from the integuments.

The fibrous structure of baleen, or whalebone, its elasticity, and its heaviness, are well known. The plates of it in the mouth of a W. are very numerous, several hundred on each side of the mouth, and they are very closely placed together, so that the mouth is filled with them; the whole quantity in the mouth of a large W. sometimes amounting to nearly two tons in weight. They are suspended from the roof of the mouth; none proceed from the lower jaw. They extend on each side from the middle line of the palate, like the barbs of a feather; those in the middle of the mouth are longest. The base of each plate is embedded in the substance of the membrane that covers the palate, whilst its edge forms a loose fringe, composed of fibres or pliant bristles. The vast mouth being opened, water is taken in; and the small animals which enter with it being retained for food, the water is allowed to escape by the sides of the mouth.

The tongue is a soft thick mass, not extending beyond the back of the mouth. The gullet of whales is very narrow; it is said not to be more than an inch and a half in diameter even in a large W., so that only very small animals can pass through it.—The head of whales occupies from a third to a fourth of the whole length. The skull is unsymmetrical, the right side being larger than the left. The flesh is red, firm, and coarse. The skin is naked, with the exception of a few bristles about the jaws, and its surface is moistened by an oily fluid. The lower surface of the true skin extends into a thick layer of *blubber*, an open network of fibres in which fat is held. The blubber is from a foot to two feet in thickness, the whole mass in a large W. sometimes weighing more than thirty tons, and serves the purpose of

keeping the animal warm, as well as of making the specific gravity of the whole body much lighter than it would otherwise be, and of resisting the pressure of the water in the great depths to which is often descends.

The skin of whales is always infested with parasites; molluscs adhere to it; certain kinds of cirrhopods burrow and live in it; and crustaceans, such as the Whale-louse (q. v.), attach themselves to it, and feed upon it.

It has been attempted to calculate the age of whales from the transverse lines on the plates of baleen, and in this way it has been computed that they attain the age of 800 or 900 years, each transverse line being assumed to indicate an annual check of growth; but it is evident that there is no good ground for the assumption on which such calculation proceeds.

In the genus *Balaena* there is no dorsal fin, nor elevation of the back corresponding to it, as in some of the family. The belly is smooth, not plated, as in the other genera of the family. The most important species, and indeed the most important of all the whales, is that known as the RIGHT W., or GREENLAND W. (*B. mysticetus*). It inhabits the seas of the northern parts of the world, and abounds chiefly in the arctic regions. It is sometimes seen on the coasts of Britain, and even in more southern latitudes. It attains a size of sixty or seventy feet in length. The body is thickest a little behind the *flippers*, or pectoral fins, tapering conically towards the tail, and slightly towards the head. The tail is five or six feet long, and from twenty to twenty-five feet broad; formed of two diverging lobes, broadest almost where they are united, but with a slight indentation. The pectoral fins are eight or nine feet long, and four or five feet broad. The mouth is fifteen or sixteen feet long. The eyes, which are situated on the sides of the head, about a foot above and rather behind the angles of the mouth, are not larger than those of an ox; but the sense of sight seems to be acute, at least in the water. The iris is white. The blow-holes are situated on the most elevated part of the head; they are from eight to twelve inches long, but of comparatively small breadth. The upper parts are velvety black, the lower parts white. The upper parts, in very old whales, sometimes become piebald, the black being mixed with white and gray. The period of gestation is uncertain; one young one is produced at a birth, and is from ten to fourteen feet in length when born. The mother displays great affection for her offspring, of which whale-fishers sometimes take undue advantage, harpooning the young one—itsself of little value—in order to secure the mother. Snorkling is performed at the surface of the water, and the mother rolls from side to side, that she and the young one may be able to breathe in turn. The usual rate of progress in swimming is about four or five miles an hour, and whales often swim not far beneath the surface of the water, with the mouth wide open to take in water from which to sift food. The W. is capable, however, of swimming with much greater rapidity, and when harpooned it often descends to a great depth in a few seconds. Its tail is extremely powerful, and a single blow of it is sufficient to destroy a large boat, or toss it and its crew into the air, so that the whale fishery is attended with no little danger. Whales usually come to the surface to breathe at intervals of eight or ten minutes, but they are capable of remaining under water for half an hour or more. When they come up to breathe, they generally remain on the surface about two minutes, during which they blow eight or nine times, and then descend. The noise which they make in blowing is very loud, and the spout of spray ejected ascends several yards into the air, appearing at a distance like a puff of smoke. They often assume, as if in sport, a vertical position, with the head down, and flap the surface of the water with the tail, making a sound which is heard two or three miles off. The Greenland W. is not properly gregarious, being generally found alone or in pairs, except when numbers are attracted to particular feeding grounds, as is sometimes the case in the bays and inlets of northern coasts.

It was formerly supposed that the Greenland W. was an inhabitant of the southern as well as of the northern parts of the world; but the SOUTHERN or CAPE W. (*B. australis*) is now regarded as a distinct species, the head being smaller in proportion than that of its northern congener, and the color a uniform black. It attains the length of 50 or 60 feet. It is usually found in comparatively shallow water near coasts. It occurs not only in the colder parts of the southern hemisphere, but throughout its temperate regions, and its range extends into the tropics. It has been taken

even as far north as Japan. Its capture is prosecuted to a considerable extent, particularly on the coasts of South Africa and New Zealand, although this whale-fishery is not nearly so important as that of the northern seas. Several other species of *Balæna* have been described, but they are imperfectly ascertained and characterised, specimens not often coming under the observation of competent naturalists in a perfect state. The *Nordkaper* of the Icelanders has by some naturalists been described as a distinct species, although it is more generally regarded as a variety of *B. mysticetus*. It differs, however, from the common variety in having the body more slender and the head proportionally smaller; the under jaw very round, deep and broad; and the plates of baleen comparatively short. It is of a gray color; the lower part of the head of a brilliant white. It is said to be more active and more fierce than the Common W., so that its capture is attended with greater danger.

The species of the genus *Megaptera* are called **HUMP-BACKED WHALES**, and by whale-fishers ordinarily *Hump-backs*. They have a rudimentary dorsal fin, in the form of an elevation of the back. There are several species, but some of them are very imperfectly known. *M. longimana*, so called from the length of the pectoral fins, is found in the North Sea, and is included in the British fauna. *M. Americana*, the **BERMUDA HUMP-BACKED W.**, occurs chiefly about the Bermudas, from which its baleen is extensively imported. Another species, *M. Passop*, occurs at the Cape of Good Hope.

The genus *Balenoptera*, *Physalus*, or *Rorqualus* is distinguished by having a dorsal fin. See **RORQUAL**.

All the species of these genera are objects of pursuit to whale-fishers, although the Greenland W. is that which they prefer.

Important as the W. is to civilised man, both for the oil and the whalebone which it yields, it is still more important to the rude natives of arctic regions, as the Esquimaux and Greenlanders, who use its oil for food as well as for burning, and to whom its flesh also is a chief article of food; while its bones and baleen are used for making tents, sledges, boats, harpoons and spears; the sinews supply a substitute for twine or thread; and the membranes are used instead of glass for windows. There is no essential difference in the way in which the capture of whales is prosecuted by the rudest tribes and the most civilised nations. The whale-fishers approach the whale in boats, and attack it by harpoons to which lines are affixed, following up and repeating the attack, until its strength is exhausted, taking advantage of the necessity which it experiences of coming at intervals to the surface to breathe, and finally killing it with lances, which are thrust into the most vital parts.

In its most simple form, the harpoon is an iron spear about 5 feet in length, with a much flattened point, having sharp cutting edges, and two large flattened barbs. Many modifications have been made, the most important perhaps being the gun-harpoon. The ordinary harpoons are attached to a long line at the opposite end to the barbed point, and when the boat is near enough to the W., the man whose duty it is darts or plunges the weapon with all his force into the animal's side. In its fleeing from the attack, the line is rapidly drawn out of the boat, until the creature is tired, and rises to the surface for air. The boat follows, keeping as much of the line as possible, until, exhausted by pain, and loss of blood, the animal succumbs. It will be seen that much depends upon the sharpness of the blade-like edges of the barbs, and their power to hold when in; hence many ingenious devices of movable barbs have been contrived, which close on the shaft of the instrument in going into the animal's flesh, but open outwards as soon as there is any strain on the shaft. The gun-harpoon is a short bar of iron with the barbed spear at the end, and a ring with chain for the attachment of the line; this is fired from a small swivel cannon attached to the whaler's boat. However well the harpoon may be fixed in the animal's body, its death and capture are still very difficult matters to accomplish, and take much time. To obviate this, a very ingenious expedient was suggested by Dr Christison, the eminent toxicologist of Edinburgh University, that glass tubes containing prussic acid should be so placed in the shaft of the harpoon, that the moment the cord or line was pulled tight, they would be broken in the animal's body, and occasion instant death. This plan has been tried with great success, but has met with opposition from the whale-fishers, who have a prejudice against using a poison which they see has such deadly effects. Another

mode of employing prussic acid is to enclose a glass tube containing it. In a hollow rifle bullet about four inches long, which is fired from a rifle made for the purpose, the bullet containing also an explosive substance connected with a fuse, which is kindled as the rifle is fired, so that the bullet bursts immediately after penetrating the whale, and spreads its deadly contents through the flesh. The bullet is made of zinc, because it breaks into fragments more angular than any other metal. The success of this method has been found to be perfect, but sailors object to its use, dreading to touch the carcass of a whale which has been killed by so powerful a poison, for a whale struck by a bullet charged with prussic acid only disappears for about five minutes, and rises to the surface dead. *Strychnia* has been used instead of prussic acid, and with similar results.

The lance used for killing the W. has generally a blade 5 or 6 inches long, and 3½ or 3 inches broad, with sharp cutting edges, and a long wooden handle.

The ships fitted out for the northern whale-fishery are generally screw-steamers of from 400 to 600 tons burden. To protect them from injury by ice, they are fortified with an additional series of planks, iron plates, and a *saiss* or ice stem, on the sides of which are *ice-knees*—angular blocks of wood filling up the concavity formed by the stem and fore-planks. The stern is also defended by *ice-plates* of half-inch iron; and many timbers and stanchions are added in the interior of the vessel, great strength being a more important requisite than fast sailing. Each ship has generally six or seven boats, *carvel-built*, from 23 to 28 feet in length, each capable of carrying 6 or 7 men, with 7 or 8 cwt. of whale lines, &c. The crew of a whaler consists of 40 or 50 men, each of whom, from the master to the boys, generally receives, in addition to his fixed wage, a gratuity for every W. caught, and a certain sum for every tun of oil produced by the cargo. Each boat carries 2 harpoons and 6 or 8 lances. When the ship arrives in the vicinity of a whaling-ground, a look-out is at once stationed at the mast-head. As soon as a W. is discovered, the boat is lowered, and a competition ensues among their crews, all exerting their utmost strength to reach the W. first. The harpooner is ready, as soon as the boat is sufficiently near the W., to hurl his harpoon with all his force; the crew instantly back the boat, and the W. generally plunges in terror to a great depth, sometimes carrying out more than 200 fathoms of line. It remains below for 30 minutes or more, and when it rises, the boats hasten to it again; it is struck with a second harpoon, and probably, instead of at once descending, it strikes violently with its tail, to destroy its enemies, when great caution is requisite. It cannot now remain long below the surface, and when it comes up, probably spouts blood through the blowholes. When it is lanced, it sometimes dies almost at once, but sometimes there is a terrific struggle—the water is lashed into foam, and dyed with blood. It not unfrequently happens, that instead of dying at the surface of the water, the W. descends, and does not rise again, so that it is lost to the whaler. The carcass of the W. is towed by the boats to the ship, and made fast to the ship's chains. The process of *flensing* is then commenced. Some of the crew, having their boots armed with iron spikes, to prevent them from slipping, descend upon the carcass, and cut into the blubber with *blubber-spades*, removing a broad strip or *blanket* of skin, 30 or 35 feet long, which is hoisted to the deck by means of a hook and tackle. Great cubical pieces of blubber, of half a ton or a ton in weight, are then cut out, and hoisted on deck. In this way, the process is carried on, the W. being turned over and over, that every part may be reached; till, in three or four hours, the whole mass of blubber is removed from it—probably amounting to 20 or 30 tons. Meanwhile, others of the crew have descended into the mouth of the W., and removed the baleen. The remainder of the carcass is then flung adrift, and sometimes sinks, but often swims, in consequence of incipient putrefaction, to afford food for bears and fishes. The blubber, after being received on deck, is cut into smaller cubical pieces, and subjected at leisure to a process by which the cellular tissue is separated from it. This is called *making-off* or *trying-out*; and to accomplish it, the blubber is heated in a large pot, and afterwards strained, the scraps or cracknels from one pot serving as fuel for another, and the ship being made filthy with smoke, soot, and grease. The product is finally stored in casks, to be conveyed home, and boiled for oil. A ton of blubber yields nearly 200 gallons of oil. A single W. often yields blubber and whalebone to the value of £700 or

2800. The whalebone is subjected to no process but that of drying till it is brought home.

Ships often return from the whale-fishery *clean*—i. e., without having captured a single whale. The greatest number of whales known to have ever been captured by a single vessel in a season is 44; yielding 299 tons of oil, of 263 gallons each. This was in 1814; the fortunate whaler belonged to Peterhead, in Scotland, and the oil alone, according to the price of that year, £22 per ton, was worth £6568. When the price of oil and whalebone has been higher, even greater profits have been realised by whalers making fewer captures.

It is usual for whalers to resort to the arctic whale-fishery in spring, and to return in autumn; but Captain Penny adopted with great success, in 1853—1854, the method of wintering in the arctic regions.

The Norwegians sent vessels to Greenland for the whale-fishery in the 9th century. They had previously prosecuted it on their own coasts, and the Norman settlers on the Bay of Biscay carried it on there, whales inhabiting that bay in considerable numbers, till, through the eager prosecution of the fishery, they became so few that about the 18th c. it became unprofitable, and was relinquished. In 1661, a tithe was laid upon the tongues of whales brought into Bayonne, they being then highly esteemed for food. The French, Spaniards, and Flemings early began to fit out vessels for the northern whale-fishery; the English entered upon it with great spirit in the end of the 16 c., and about the same time the Dutch, Danes, and Hamburgers. The British Muscovy Company obtained a royal charter, giving them a monopoly of the whale-fishery of the coasts of Spitzbergen, on the pretence of its having been discovered by Sir Hugh Willoughby, although, in fact, it was discovered by the Dutch navigator Barents. Other nations were not disposed to acknowledge the claims of the English; the Dutch in particular sent out a strong fleet, between which and the ships of the Muscovy Company an engagement took place in 1618, and the English were defeated. The Spitzbergen bays and seas were afterwards divided into fishing-stations, allocated to the whalers of the rival nations. No nation now asserts a claim to the exclusive right of whale-fishing in any quarter. The Spitzbergen fishery was thrown open to all nations in 1642.

The English for some time prosecuted the whale-fishery sluggishly and with incompetent means; the Dutch carried it on with great vigor and success. During the latter half of the 17th c., the Dutch furnished almost all Europe with oil. In 1680, they had 260 ships and about 14,000 men employed in the whale-fishery; but from that time the Dutch fishery began to decline. In 1732, Great Britain attempted to encourage the whale-fishery by a bounty of 80s. a ton to every ship of 200 tons engaged in it, which was raised in 1749 to 40s., reduced to 30s. in 1777, and again raised to 40s. in 1781. The object of the bounty was not only to encourage the trade, but to make it a nursery for seamen. Ships, however, were fitted out rather for the bounty than for the capture of whales, and during the next five years after the reduction of the bounty in 1777, the number of ships employed in the trade was reduced from 106 to 59. After 1781, it rapidly increased, and continued to increase although the bounty was reduced. The bounty was finally altogether withdrawn in 1894; yet in 1816, when the British whale-fishery was in its most flourishing condition, only 164 ships were engaged in it. The Dutch whale fishery had in the meantime almost entirely ceased, owing to the national calamities consequent on the French Revolution. The British whale-fishery is still prosecuted, although not nearly to the extent that it was fifty years ago. The French whale-fishery has in like manner declined. The Americans are at present more actively engaged in the whale-fishery than any other nation. The New England colonies entered upon this enterprise at a very early period, at first merely by boats on their own coasts, which, however, were deserted by whales before the middle of the 18th c., and ships then began to be fitted out for the northern seas. For a number of years, however, the American whale-fishery also has been declining, owing to the scarcity of whales, and because substitutes for whale-oil and whalebone have been found.

Of all British towns, Peterhead and Dundee are those which of late have shewn the greatest enterprise in the whale-fishery, and next to them is Hull. In America, New Bedford demands special notice. It is at present the greatest whaling-port in the world.

Whalebone
Wharton

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The ships engaged in the whale-fishery generally add to their cargoes of oil by the capture of seals.

WHALES, in point of law, belong to the crown, according to the law of England, if they are caught or found within the territorial sea—that is, within the limit of three miles from the shore; or in the inner seas, as distinguished from the open sea. This is contrary to the general rule—that he who first captures a wild animal is entitled to the property thereof. Whales are thus called royal fish; and it is said sturgeons and porpoises also fall under the same class. If the whales are not caught in the territorial seas, which are part of the realm, but in the open sea, then the law of nature applies, or rather a secondary law or custom governs the right of property, and that law, though varying slightly according to locality, is, that the person who first captures the whale is entitled to keep it. In the Greenland seas, the local custom is that the first harpooner who strikes the whale is entitled to the property only if he continues to hold the whale by the line attached to his harpoon; but if his line break, and a subsequent harpooner from another ship finish the capture by obtaining possession, then the latter is entitled, for it is a loose fish. This rule, however, has been qualified in this way, that the first harpooner who strikes the fish and keeps it entangled is entitled, even though a volunteer come up and officiously strike the fish, thereby causing it to struggle and break from the first line. At Gallipagos, South America, the custom is that he who first strikes the whale with a droug, or loose harpoon, is entitled to receive half of it. The same rules govern the right of property in whales when similar questions arise between parties litigating in Scotland. The law of Scotland, as well as England, adopts whatever local custom prevails where the whale was captured.

WHA'LEBONE. The baleen plates which take the place of teeth in the mouths of the Baleen Whales (see WHALE), constitute the whalebone of commerce. They vary in length from a few inches up to ten, and even in rare instances to twelve feet. Their chemical constitution is albumen hardened by a small proportion of phosphate of lime. Their color is usually of a bluish black, but in some species they are striped longitudinally with bands of a whitish color; and they terminate at the point in a number of coarse black fibres of the baleen, which fibres are also found more or less down both sides of the blade. These fibres are much used by brush-makers. There are three principal kinds in the market, and they are generally known as *whale-fins*. The first is the *Greenland*, or Davis' Strait and North Sea fins; second, the South Sea, or black fish-fins; third, the North-west coast, or American whale fins. Whalebone requires some preparation before being fit for use; this, however, is very simple. It is first trimmed—that is, all the hairs are removed from the point and edges of each blade; and generally the surface of each flat side is scraped. The blades are then boiled in water for several hours, until they become soft enough to be cut easily with a common knife. The workman then cuts them into lengths fitted for the purposes to which they are to be applied. They are chiefly used in thin strips, such as stay-bones and umbrella-ribs, and can be easily split for such purposes, owing to their lamellar structure. Generally, the boiling is combined with a dyeing process, to make the whalebone perfectly black, which is preferred to the not agreeable natural color. The quantity annually imported into Britain rarely exceeds 150 tons; but as the price ranges from £350 to £500 per ton, that represents a large value.—Strips of rattan canes dyed black are used as a cheap kind of artificial whalebone, but the best imitation is made of vulcanite or prepared caoutchouc, which in many respects is superior to the real whalebone.

WHALE-LOUSE (*Cyamus*), a genus of Crustacea, of the order *Lamodipoda*, having the body short and rather broad; the legs short and stout; seven pair of legs; the first pair more slender than the rest; the first, second, fifth, sixth, and seventh pair furnished with sharp hooked claws, the third and fourth not terminating in claws, but in a long almost cylindrical joint. All the species are parasitic on Cetacea, attaching themselves to the skin by means of their claws. Whales are sometimes so completely covered with them, as to appear of a whitish color even at a distance; and when the whale is captured, its skin is found to be deprived of the epidermis. *Cyamus Ceti* is said also to infest the mackerel and other fishes of the family *Scomberidae*.

WHANG-HAI', or Yellow Sea, an important inlet of the Pacific Ocean, washes

the north part of the east coast of China, and is bounded on the w. by the Chinese provinces of Shang-tung and Keang-su, and on the e. by the peninsula of the Corea and Japan. It terminates on the north-west in the Gulfe of Pe-ehih-li and Leno-tong, and opens out in the south-east into the Tung-hai, or Eastern Sea. It is more than 600 miles long, and over 400 miles in average breadth. The W. is shallow, and near the land its waters are of a lemon color, owing to the nature of the bottom, which is often furrowed by vessels navigating it. By degrees, it is becoming more and more shallow, owing to the quantity of alluvium borne down into it by the rivers Hwang-ho (q. v.) and Yang-tze (q. v.).

WHARNCLIFFE MEETING. By a standing order of the House of Lords which was proposed by Lord Wharncliffe, and is still known by the title of the "Wharncliffe Order," no bill to empower any company already constituted by act of parliament to execute, undertake, or contribute towards any work other than that for which such company was originally established, or to sell, lease, or abandon its undertaking, or any part thereof, or to amalgamate with any other undertaking, or to dissolve, is allowed to proceed in the House of Lords until it is reported that such bill has been submitted to a special meeting of the proprietors of the company, convened by public advertisement, and by circular addressed to each proprietor; that such meeting was held not earlier than seven days after the last insertion of such advertisement; and that at such meeting the bill was submitted to the proprietors present, and approved of by proprietors present, in person or by proxy, holding at least three-fourths of the paid-up capital of the company represented at such meeting. Of late years a number of bills are in each session originated in the House of Lords; and since the introduction of this practice, the meetings held in conformity with this order are popularly known as "Wharncliffe Meetings." The House of Commons has adopted a corresponding standing order applicable to such bills coming from the Lords.

WHARTON, Philip Wharton, Duke of, was the son of Thomas, Marquis of Wharton, an eminent member of the Whig party in Queen Anne's reign, and Lord-lieutenant of Ireland from 1708 until after the fall of the Godolphin administration in 1710. Macaulay says he was licentious and corrupt; put the faults of his Irish administration were largely redeemed by his appointment of Addison as Chief-secretary. George I. made him Lord Privy Seal and Marquis of W. in 1715, but he died three months afterwards. His son, Philip, born 1696, was educated at home by his father, who aimed at making him a great orator, a Whig in politics, and a Presbyterian in religion. In a boyish freak, he contracted a clandestine marriage at the Fleet with the daughter of Major-general Holmes. The shock is said to have killed both his parents. W. soon parted from his wife, and in 1716 went abroad with a French Huguenot tutor, to be brought up according to his father's dying instructions, in strict Presbyterian principles, at Geneva. He contracted debts, spurned the restraints of his tutor, and ran away to Lyons. He visited the Pretender at Avignon, and, it is said, accepted from him the title of Duke of Northumberland. He next visited Paris, and after various extravagances, set out for Ireland, where, although he had not yet reached his 19th year, he was allowed to take his seat in the House of Peers. He soon displayed such splendid abilities in debate, and supported the government with so much zeal, that although still under age, he was, January 20, 1718, raised to the highest rank in the English peerage. He did not take his seat in the English House of Peers until 1720. Here he opposed with much warmth the government measure on the South Sea Bill, and the bill of pains and penalties against Bishop Atterbury. His affairs became hopelessly involved by his extravagance, so that although he had succeeded to an estate of £16,000 a year, he was soon compelled to accept a yearly allowance of £1200 from his creditors. He set up a political paper, called the "True Briton," in 1723; and lost no occasion of speaking, as well as writing, against the ministry and the court. In 1724, he set out for Vienna, and then visited Madrid, where he was served with an order from the Privy Seal to return home. He treated the order with contempt, and afterwards went to Rome, and appeared openly at the court of the Pretender, from whom he accepted the Order of the Garter. He now assumed the title of Duke of Northumberland. In 1727, he fought with the Spaniards and against his countrymen at the siege of Gibraltar. This last mad act lost him his English title and estates, and led to his conviction under a bill of indictment for high treason. He refused to

make his submission to the government; and the rest of his life was passed in France and Spain, at one moment squandering his precarious supplies of money in drunkenness and luxury, and at another suffering the extremest poverty. He died in a miserable condition at a Bernardine convent in Catalonia, May 31, 1731. His brilliant talents and wasted life were sketched by Pope in his *Moral Essays*, in the lines beginning—

Wharton, the scorn and wonder of our days.

The "Life and Writings of Philip, late Duke of Wharton," were published in 1733 (Lond. 2 vols. 8vo); and another two-volume publication, entitled "The Poetical Works of Philip, late Duke of Wharton, and of the Duke's Intimate Acquaintance," appears, with the exception of the title-page and a prefixed biography of W., to have been printed in 1737. This publication, however, contains little that is even attributed to the duke.

WHATELY, Richard, Archbishop of Dublin, was born in Cavendish Square, London, 1st February 1787, and was the fourth son of Dr Joseph Whately of Nonsuch Park, Surrey, Prebendary of Bristol, Vicar of Wiford, and lecturer at Gresham College. He was sent in due time to a private school at Bristol, from which, in 1806, he passed to Oriel College, Oxford. He took his Bachelor's degree in 1808, taking a second class both in classics and in mathematics. He got the English-essay prize in 1810. In the following year, he was elected a Fellow of Oriel College, which at that time ranked among its Fellows not a few men destined to play a considerable part in the world, and already remarkable for their attainments and intellectual activity—e. g., Arnold, Keble, Pusey, and the elder Newman. In 1815, he became one of the tutors of his college; and about this time he wrote (originally for the "*Encyclopædia Metropolitana*") what he afterwards expanded into his popular treatises on Logic and Rhetoric. In 1831, he married a daughter of W. Pope, Esq., of Hillingdon, Middlesex. In the same year, he published two works: the one a volume of sermons on "The Christian's Duty with respect to the Established Government and the Laws;" the other a work which is among the most celebrated and characteristic of his writings: this was "Historic Doubts relative to Napoleon Bonaparte." Its object was to throw ridicule upon the criticism to which the Gospel narratives were subjected by sceptical writers, by applying the same kind of criticism to events within the memory of all the world, and starting doubts as to whether these events had occurred. This *jeu d'esprit* with a purpose created a great sensation. It has been translated into several foreign languages. In 1822, W. was presented to the living of Halesworth, in Suffolk. In the same year, he delivered the Bampton Lectures at Oxford, taking for his subject the "Use and Abuse of Party Feeling in Religion." In 1825, he was appointed by Lord Grenville Principal of St Alban's Hall, which, under his energetic rule, quickly lost the bad character it had long sustained in the university. In 1829, he was appointed Professor of Political Economy; but he was destined not to hold this office long enough to do more than deliver an introductory course of lectures. In 1831, Lord Grey's government, at the instance of Lord Brougham, appointed him Archbishop of Dublin and Bishop of Glendallagh. Afterwards, in 1846, his episcopal charge was enlarged by the addition of the bishopric of Kildare.

During the ten years preceding his appointment to the archbishopric, W. had incessantly been writing and publishing, chiefly upon theological and ecclesiastical subjects. He belonged to the Liberal school in religion and in politics; and he was opposed, that is, to High Church or Catholic views in theology, and to Toryism in politics. He had taken a keen interest in the political questions of the time, and especially had made himself conspicuous in the university by his advocacy of Catholic emancipation, of which the party in the church which had most sympathy with the theology and ecclesiastical system of the Roman Church were the most determined opponents. When Sir R. Peel, after his change of views on the emancipation question, voluntarily submitted himself for re-election to the university, W., though a Liberal, came forward to support him, and was one of the most active of those who endeavored to prevent his rejection. His "Essays on some of the Peculiarities of the Christian Religion" appeared in 1825; his "Elements of Logic," in 1826; the "Elements of Rhetoric," in 1828; his "Essays on some of the Difficulties in the Writings of St Paul," &c., also in 1828; his "Thoughts on the Sabbath,"

in 1830; and in the same year, the "Errors of Romanism traced to their Origin in Human Nature." His "Introductory Lectures on Political Economy" were published in 1831. By this time, his writings, and the great activity and ability which he displayed in his various public functions, had placed him among the foremost men of the university, and had also got him rank among the most remarkable thinkers and writers of his time. Though many distrusted him as a Liberal, questioned the soundness of some parts of his theology, or thought his manners too eccentric, and his habit of mind too peculiar, for one who was to rule over others, nobody questioned that his abilities and reputation were equal to the high position bestowed upon him by Lord Grey.

As Archbishop of Dublin, W. was very active in all matters of importance, social and ecclesiastical, and shewed a deep interest in every question affecting the welfare of Ireland. He was one of the original members of the Board of National Education, and continued a member till 1853, when he retired, in consequence of a departure, as he thought, having been made from the principles on which, up to that time, the national education had been carried on. He was perhaps the most active member of the Board, and the success of the national system was in a great measure owing to him. He and members of his family were always foremost in supporting well-devised charitable schemes. His liberality was, in fact unbounded, though an opposite impression prevailed among those who did not know him, because he wrote and spoke strongly against casual benevolence, and used to say he had never given a penny to a beggar. As archbishop his rule was firm and judicious. A slight disregard of etiquette was about the worst thing ever alleged against him; he was not disposed to make much difference between a rector and his curate. His activity as an author was not stifled by his energetic discharge of his public duties; indeed, he seems to have been always either writing a book, or affording literary help to others. Besides many charges, sermons, and a few pamphlets, his "Kingdom of Christ Delimited," one of the most remarkable of his works; his "Introductory Lectures to the Study of St. Paul's Epistles;" his "English Synonyms;" and his annotated edition of "Bacon's Essays"—perhaps the best example of good editing in the English language—belong to this period of his life. A work, published anonymously in 1855, "Scripture Revelations respecting Good and Bad Angels," has been generally ascribed to Whately.

He died on the 8th October 1863. The world's esteem and the regard of his friends for him had been growing to the last. In early life, there was much about him to shock the fastidious, and some things which might hurt the sensitive; but his peculiarities softened and wore off as he advanced in years. At Oxford he was noted for his rough unceremonious manners, for which (together with his dress) he was nicknamed the "White Bear;" and for the plain speaking and rough ridicule with which he would overwhelm an opponent in an argument. He was remarkable, too, for his fondness for athletic sports, which he indulged with a perfect indifference to the minor proprieties. He used to say that his abrupt and careless and seemingly unfeeling ways were a recoil from the painful shyness for which he had been remarkable in his youth. Those who knew him, however, made light of his peculiarities; and few things about him are more pleasing than his firm belief in the merits of his friends, and the number, the warmth, and the permanence of his friendships. He had great talents for conversation, and was famous for his bon-mots, happy repartees, and conversational pleasanties of every kind. His writings are not so much remarkable for subtlety of thought or novelty of view as for strong logic, acuteness, felicity of arrangement and exposition, and the frequency and homely force of his illustrations. He had the happy power of building up materials which might be old into a new commodious, and almost a beautiful structure. He did nothing for mere ornament's sake: though his imagination was abundantly fertile, it was used only to illuminate his argument; his images are seldom impressive for their beauty, though admirably fitted for didactic purposes. His theological works have been charged with a "cold rationalistic" tendency, and with being wanting in reverence; and it has been inferred, though perhaps too hastily, from some passages in his writings, that he was heretical on the subject of the Trinity. The "Historic Doubts," the "Essays on the Peculiarities of the Christian Religion," the "Errors of Romanism," and the "Kingdom of Christ," are perhaps the most valuable and characteristic of his

writings.—The "Life and Correspondence of R. Whately, D.D., &c." by his daughter, E. Jane Whately, was published at London in 1866. It is an interesting, though in some respects a partial, and in some degree an inadequate, memorial of Dr Whately. As might be expected, the "White Bear" side of his character is kept in the shade: but few examples are given of the coarse but racy conversational wit which was one of the Archbishop's claims to distinction among his contemporaries. And it is scarcely possible to gather from it what his exact position was in theology or in literature, though the letters, which form a great part of it, give a very fine impression of the qualities which distinguish his works.

WHEAT, the most valuable and, next to maize, the most productive of all the cereal grasses. The genus *Triticum*, of which the species are popularly known either as *Wheat* or *Wheat-grass*, is distinguished by a spike with many-flowered spikelets, without stalks, and seated one on each notch of the rachis, their sides directed to the rachis, which is zigzag; and two glumes, of which the lower is either awned or awless; the outer palea of each floret having at the top a notch, in the centre of which is the terminal point, sometimes prolonged into an awn, or, in some species, with many florets tapering into an awn without a notch. A number of species are found in Britain, of which *T. repens*, well known as Couch Grass (q. v.), is the most common; but the seeds of none of them are of any value. The native country of the cultivated W. has generally been supposed to be the central part of Asia; but a discovery was made not many years ago by M. Fabre of Agde, in the south of France, that the *Egilops ovata*, a grass of the regions near the Mediterranean, and of the west of Asia, becomes transformed by cultivation into wheat. The announcement of this discovery was at first received with much doubt, although the possibility of the transformation had been suggested by previous botanists; but it has been confirmed by subsequent observations and experiments. The genus *Egilops*, as hitherto recognised by botanists, is distinguished from *Triticum* chiefly by its more numerous awns, the glumes of *E. ovata* being generally terminated by 3 or 4 awns, prolongations of their ribs, and the palea by 2 or 3 short awns. The awns of grasses, however, afford very uncertain characters, being extremely liable to disappear through change of circumstances; and among the cultivated varieties of W., every farmer is familiar with some that are awned or bearded, and some that are beardless having scarcely a trace of awn. In the wild *Egilops*, the ear is also much more easily broken from the rachis than in wheat. In cultivation, the *E. ovata* very soon loses the awns of its palea and of the lateral ribs of its glumes, and thus assumes the characters of W., the ears at the same time losing their fragility, the grain also increasing in size, whilst the floral envelopes are proportionally diminished, the leaves becoming larger, and the stem stronger. From seeds of the *E. ovata* sown in a garden in 1838, M. Fabre obtained W. of fair quality in 1846. Professor Buckman, of the Royal Agricultural College, repeated the experiment in England. His first sowing was in 1856, and notwithstanding the disadvantages of cold seasons and a cold situation on the Cotswold Hills, he found the spikelets much modified in 1859, the warm summer of that year producing a greater change than had taken place in previous years (see "Popular Science Review" for October 1861). The identity of the principal cultivated forms of *Triticum* with *E. ovata* may now be regarded as fully established. These forms have generally been included by botanists under the name *T. vulgare*.

W. has been cultivated from the earliest ages, and was a chief crop in Egypt and Palestine, as it still is in all the temperate parts of Europe, Asia, and Africa. It is cultivated to a considerable extent in the North of India. In North America, it is very extensively cultivated, and many parts of the United States and British provinces are admirably adapted to it. Wide regions of South America are equally suitable, and W. of the finest quality is produced in Australia. In the torrid zone, W. does not succeed, except in elevated situations; but it nowhere succeeds better than in subtropical regions, although it is a hardy plant, and when covered by snow, endures even very severe winters in the north of Europe. For its successful cultivation, however, it requires a mean temperature of at least 55° F. for three or four months of the year. It is an annual plant, and its capacity of enduring the cold of winter is of importance only in connection with the advantage to be derived from sowing in autumn, so as to have it more forward in spring. Its cultivation does not extend so far north as that of barley or oats, or even of rye. In Europe, its nor-

thern limit is about lat. 60°. The quality of the grain varies much in different soils and climates, and particular varieties are also distinguished by difference of quality as well as by external characters. The W. of the eastern parts of Britain, where the climate is comparatively dry, is superior to that of the western parts, where the sky is more cloudy and the climate more humid, although the crops in the west are not less luxuriant; and the W. produced in Britain is not found suitable for the manufacture of macaroni, to which that of the countries near the Mediterranean is particularly adapted. Although hardy in winter and early spring, W. becomes more delicate and susceptible of climatic influences as it advances in growth; a prevalence of dry weather, with bright sunshine from the time when it comes into ear until it is ripe, is of the greatest importance.

COMMON W. (*T. vulgare*, *cestivum*, or *sativum*), grows to a height generally of 3 or 4 feet, and has ears or spikes generally 3 or 4 inches long; the spike 4-cornered, the spikelets about 4-flowered; the paleæ ventricose, ovate, truncate, mucronate or awned, compressed under the point, rounded at the back, the grain free. In consequence of long cultivation, in a great variety of climates, the cultivated varieties of W. are very numerous, more so than in any other kind of grain. New varieties are continually coming into notice; and many are in high estimation in particular districts, although little known beyond them. Some botanists have attempted to distinguish species among them, appropriating the name *T. aestivum* to the awnless kinds, and *T. hybernium* to the awned; but intermediate forms are very numerous, and the length or shortness of the awn seems to depend on accidental circumstances. Nor do the awnless or beardless kinds perfectly correspond with the Summer W. of farmers, preferred for sowing in spring with a view to a crop in the same season, and the awned or bearded kinds to the Winter W., sown in autumn, as some of the hardy varieties of Winter W. are awnless, and some of those usually sown in spring are bearded. Besides being classified as Bearded and Beardless, the varieties in cultivation are also distinguished according to the color of the grain, as *White* and *Red* wheats. Some having the ears covered with a short soft down are known as *Woolly* wheats. There are also differences in the length and compactness of the spike, and in the size and form of the grain, which is more rounded in some, and more elongated in others. A number of varieties, having the spikes very compact or square, have been sometimes classed together under the name of *T. compactum*, and the distinction is very obvious and permanent, although there is no reason for regarding it as characterising a distinct species. Akin to this is the MUMMY W. (*T. compositum*), in which the spike is branched, and which is said, but on insufficient evidence, to have been produced from seeds found in mummy-cases in Egypt. Mummy W. has been grown in England, of which the ears have had 10 or 11 branches, and 160 grains have been found in one ear; whilst 60 ears have been produced by a single seed. Notwithstanding these apparent advantages, however, this variety does not serve the purposes of the farmer so well as some others. In another group of varieties with compact ears (*T. turgidum* of some botanists), the glumes are remarkably tumid, and always awned. These are known by the names of Gray W., Pollard W., Duckhill W., &c., and in Germany are commonly called English Wheat. Polish W. (*T. Polonicum*) is the common name of a number of kinds of a very peculiar appearance, with a long, loose, and somewhat nodding spike; the glumes awned, and remarkably long—twice the length of the florets. The stems are also very tall, sometimes more than 6 feet high. These kinds, sometimes called *Grecian* or *Mogadore* W., are cultivated in some parts of the south of Europe, in the south of Siberia, and in Africa. HARD W. or HORNY W. (*T. durum*), has rather small, elongated, and very hard grains, the paleæ have remarkably long awns, and the leaves are very broad. It is much cultivated in the countries near the Mediterranean, and Dr Royle suggests that it would be a valuable acquisition to India, as it yields a good crop on comparatively sterile soils.

The red varieties of W. are generally more hardy than the white; the grain is inferior in quality, and yields less flour, but these disadvantages are more than counterbalanced in many soils and situations by the greater productiveness of the crop. Red wheats are therefore preferred for comparatively poor soils, but the white kinds are generally cultivated wherever the soil and climate are suitable. The varieties with long straw yield the best crops in dry seasons, but the short-strawed kinds are best when the season is wet. W. is peculiarly suited to clay soils, and rich heavy

loams; but with good farming, excellent crops are produced even on light sandy or gravelly, and on chalky soils. Where the climate is moist, a light dry soil is most suitable; soft deep soils being productive chiefly of straw. The land intended for W. must, at least in Britain, be in a high state of cultivation. W. is commonly sown after green crops, beans, or bare fallow; in the south of England, often after grass or clover. It may be sown, at least in autumn or the beginning of winter, when the ground is so saturated with moisture, that any other kind of grain would be almost sure to perish. It is either sown broadcast or in drills, and the practice of drilling becomes more and more prevalent, both on account of the saving of seed and the superiority of the crops produced. The land prepared for W. is very often manured with farm-yard manure; artificial manures—as guano—are also used. In Scotland, it is a common practice, when W. is to be grown after turnips, to plough down the turnip-leaves in autumn, before the W. is sown, and to apply guano in spring. Nitrate of soda is another favorite top-dressing for W., but it sometimes causes the plants to grow too rapidly, so that they become tender, and suffer in consequence from climatic influences. Many farmers use both guano and nitrate of soda for top-dressing W., and the nitrate of soda is often mixed with common salt, which is thought to be useful in giving strength and vigor to the W. plants, preventing *lodging* and mildew. W. ought to be reaped before it is *dead ripe*, unless when it is intended for seed, and it ought to be stacked as soon as it is sufficiently dry to be free from danger of heating. On very rich land, W. sometimes becomes too luxuriant in spring, and its growth needs to be repressed by cutting the leaves with a scythe—a practice essentially agreeing with that mentioned by Virgil in his "*Georgics*" (l. 111), of allowing cattle to feed upon the young blades:

Quid, qui, ne gravidis procumbat culmus arctis,
Luxuriam segitum tenera depascit in herba,
Quam primum sulcos sequant sata?

The relative proportions of straw and grain differ very much in different varieties of W., and according to differences of soil, climate, and season. The proportion of the weight of grain to that of the whole plant when dried so as to be ready for stacking, varies from 30 to 47 per cent. The composition of the grain itself varies considerably, as to the proportions of starch, gluten, &c. which it contains. 100 parts of the grain of W., dried in the ordinary manner, contain on an average—water 14.33; gluten, 19.64; albumen, 0.95; starch, 45.99; gum, 1.53; sugar, 1.80; oil, 0.37; vegetable fibre, 12.34; ash, 2.36; total, 100.00.

The ash is rich in phosphoric acid, magnesia, and potash. Its composition is as follows: potash, 29.97; soda, 3.90; magnesia, 12.80; lime, 3.40; phosphoric acid, 48.00; sulphuric acid, 0.33; silica, 3.35; peroxide of iron, 0.79; chloride of sodium, 0.09; total 100.00. For the processes by which starch and gluten are obtained from W., see these articles.

The value of W. depends mainly on the quantity of fine flour which it yields; the best W. yielding 76–80 per cent., sometimes even 86 per cent. of fine flour, whereas inferior kinds seldom yield more than 68 per cent., and sometimes only 54–56 per cent. In general, the smoother and thinner the grain is in skin, the greater is the produce of fine flour. The greater part of the husk of W. is separated from the flour by the miller, and is known as *bran*. That portion of the bran which is more finely divided than the rest, receives the name of *sharps* or *pollard*. See the articles *BRAN* and *FLOUR*.

W. straw contains, on an average, in its ordinary state of dryness—nitrogenous substances, 1.33; non-nitrogenous substances, 67.55; mineral substances, 4.69; water, 26.00; total, 100.00; and the composition of the ash is as follows: potash, 12.14; soda, 0.60; magnesia, 2.74; lime, 6.23; phosphoric acid, 5.43; sulphuric acid, 3.33; silica, 67.83; peroxide of iron, 0.74; chloride of sodium, 0.22; total, 100.00.

The principal diseases to which W. is subject, some of which are often productive of great loss to the farmer, are either owing to or connected with the presence of parasitic fungi. See *BUNT*, *MR'DEW*, *RUST*, and *SMUT*. An animalcule causes the disease known as *EAR-CKOCKLES* (q. v.). W. suffers also from the ravages of numerous species of insects. See *HESSIAN FLY*, *WHEAT FLY*, *CORN-MOTE*, and *WIRE*.

WORM. The larva of a Ground Beetle (*Zabrus gibbus*) is often very destructive to young W. in winter and spring.

SPELT (*Triticum spelta*) is regarded as a distinct species from Common W., and is supposed to be a cultivated form of *Eglops caudata*, a native of the countries near the Mediterranean. The spikelets are smaller than in common W., and each spikelet has two or three, rarely four, perfect florets, besides a barren terminal one, the outer glumes and the paleæ are very broadly truncate at the top, and notched, the awns very slender; the ripened grain adheres closely to the paleæ or chaff. Spelt is supposed to be the grain called *Zea* by the Greeks and *Far* by the Romans. It is of little value in comparison with W., but can be grown on inferior soils, and is cultivated in Switzerland at an elevation where W. would not succeed. The bread made of it is coarse, and is used chiefly by the poorer classes.—Another species, sometimes called **LESSER SPELT**, or **ONE-GRAINED W.** (*Triticum monococcum*), is also occasionally cultivated on poor soils and in elevated situations in the centre and south of Europe. It is sometimes called *St Peter's Corn*. The ear is small and compressed, the spikelets contain only one perfect floret and a rudimentary one; the awns are long; the grain is small and adheres closely to the chaff.—*Triticum Bengalense* may be regarded as a kind of spelt. It has remote spikelets, long awns, and long irregularly triangular grains. It is cultivated to some extent in India.

Wheat being the most esteemed of all the cereals, particularly for the making of bread, the increase of its cultivation and use has marked the progress of agriculture and of wealth in many countries and particularly in Britain. It is only of late that bread made of wheat has become a common article of food among the laboring classes in Britain. In some parts of the country, it is still, indeed, far from being a principal article of food among the peasantry, who use barley and oats in various forms. In the 8th c., the monks of the abbey of St Edmund, in England, ate barley-bread, because the income of the abbey would not admit of their using wheaten bread regularly. At a later period wheat was largely used, at least in the southern parts of England, for a short time after harvest, but the supply was soon exhausted, and recourse was again had to inferior kinds of food. There was then no trade in corn to equalise the price over the year. In 1817, when an abundant harvest had been gathered in, the price of wheat fell at once from 80s. to 6s. 8d. per quarter. The rejoicings of harvest-home were, therefore, in these times connected with a transition from poor to good fare, and from comparative want to abundance, such as happily does not attend the same occasion in our day. Down to the end of the 17th c., wheaten bread was a principal article of food only among the more wealthy; and the servants in their houses were still furnished with oats, barley, and rye. In the northern parts of England, as well as in Scotland, the use of wheaten bread was comparatively rare even at the middle of last century. "So small was the quantity of wheat used in the county of Cumberland," says Eden, in his "History of the Poor" (1797), "that it was only a rich family that used a peck of wheat in the course of the year, and that was used at Christmas. The usual treat for a stranger was a thick oat-cake (called *haver-dummock*) and butter. An old laborer of 86 remarks that when he was a boy he was at Carlisle market with his father, and wishing to indulge himself with a penny loaf made of wheat-flour, he searched for it for some time, but could not procure a piece of wheaten bread at any shop in the town." At the period of the Revolution, 1689, the quantity of wheat grown in England was estimated at about 14,000,000 bushels, or about three bushels to each of the population, which was then under five millions. In 1828, about 100,000,000 bushels were produced, or about seven bushels to each of the population, then under fifteen millions (see "Library of Entertaining Knowledge;" "Vegetable Substances used for the Food of Man," Lond. 1832). In 1875 there were 8,240,344 acres under wheat in England and Wales, and 102,187 acres in Scotland, the produce of which may be estimated at about 100,000,000 bushels; besides which, a very large quantity of wheat is imported from other countries. The cultivation of wheat now extends to the most northern parts of Scotland, 4705 acres having been under this crop in 1875 in the county of Elgin, and 6189 in Ross and Cromarty, and even in Sutherland 114, and in Caithness 88 acres. The population of England and Scotland being now about 26,000,000, it appears that the quantity of home-grown wheat consumed amounts to nearly 4 bushels for each of the population; but the wheat imported in 1875 amounted to about 12,000,000 bushels;

raising the amount consumed to nearly 7 bushels per head of the population. Ireland is left out of account, as not being to a great extent either a wheat-growing or a wheat-consuming country. The produce per acre is greater in Britain than in any other wheat-growing country, owing to superior farming, notwithstanding disadvantages of climate and often of soil. The extent of land now under wheat, has, however, of late years diminished, owing to the foreign supply, and the high price of butcher-meat making pasturage now profitable. The quantity of wheat produced in the United States in 1874 was estimated at about 309,103,700 bushels. The chief wheat-growing states and their production in 1873 were—Iowa, 24,600,000 bushels; Illinois, 23,417,000 bushels; Minnesota, 23,056,000 bushels; Wisconsin, 22,322,000 bushels. The progress of wheat-cultivation in the western states has been extremely rapid. Iowa now produces more wheat than any other state of the union. Chicago has become one of the greatest wheat-exporting ports in the world. The exportation of wheat from Chicago began in 1838, when 78 bushels were exported; and in 1872, the quantity exported amounted to 12,160,046 bushels; this rapid increase being solely due to the increase of wheat-culture in previously unsettled regions. The greater part of the wheat exported from North America is to Great Britain. Of the wheat imported into the United Kingdom in the year 1875, the United States contributed 45 per cent.; Russia, 18 per cent.; Germany, 12 per cent.; British North America, 7 per cent.; Egypt, 4 per cent.; France $2\frac{1}{2}$ per cent.; and Turkey, $2\frac{1}{2}$ per cent.

WHEAT-EAT, or Fallow-Chat (*Saxicola cenanthe*), a bird of the genus popularly known by the name Chat (q. v.), of the family *Sylviadae*, a common summer visitant of Britain, abounding on downs and fallow fields. Its geographic range is wide. Its winter retreat is in the countries near the Mediterranean, and chiefly in Africa; its summer migrations extend to the furthest north of Europe, and to Iceland and Greenland. A few wheatears spend the winter on the southern coasts of England. The entire length of the W. is about six inches and a half; the tail is almost square; the wings are long and pointed; and the legs are long, enabling the bird to hop about actively in quest of food. Its food consists of worms and insects, and it may often be seen perched on the top of a clod or stone, looking out for them, and at the same time on the watch against enemies. The male is of an ash-brown color on the upper parts; the forehead, a band above the eyes, and the throat, white; a black mark extending from the base of the bill to each eye, and expanding behind it, so as to cover the orifice of the ear; the wings, black; the rump, and two-thirds of the tail, except the two middle feathers, white; the tip of the tail, black; the two middle feathers of the tail, entirely black; the breast, buff-color; the belly and flanks, pale buffy white. The female is less gaily colored, brown and gray prevailing. The W. makes its nest in an old wall, or in a crevice of a quarry or gravel-pit, often in a deserted rabbit-burrow, and generally lays six pale-blue eggs. The male has a pleasant, but not loud song, and sings well in confinement, in winter as well as in summer. This little bird is much esteemed for the table, and great numbers are therefore annually caught, not only on the continent of Europe, but in England, where comparatively few small birds are sought after for such use. It is chiefly on the downs of the south of England, where vast flocks congregate before their autumn migration, that wheatears are caught for the market. The shepherds catch them by means of nooses placed in little excavations made in the ground, advantage being thus taken of the habits of the bird, which upon the least alarm, or even the shadow of a passing cloud, runs to hide itself in any little hollow that may be near. The usual practice of the shepherds is to cut out an oblong piece of turf, about 11 inches by 8, and 6 inches thick, which they lay across the hole that is made, making sloping entrances at the ends of the hole, and setting nooses under the turf in the centre. As many as 84 dozen wheatears have been thus caught by a single shepherd in a day. It is not unusual for a shepherd and his lad to look after from 500 to 700 of these traps. The season for catching wheatears extends from the end of July to the end of September. They are partly sent to the London market, but very many are consumed at the watering-places on the Sussex coast.

WHEAT-FLY, the popular name of certain species of dipterous insects, which are often very injurious to wheat-crops. One of them, *Cecidomyia tritici* (see *CECIDOMYIA*), sometimes called the **WHEAT MIDGE**, and belonging to the same

genus with the destructive Hessian Fly of America, is too common both on the continent of Europe and in Britain, but fortunately is not very abundant except in particular years. It is supposed to be the same fly which appeared in the north of New England in 1828, probably imported from the Old World, and thence spread into New York and Canada, destroying a tenth part of the wheat-crop for several years, and only disappearing on being starved out by a change of crop, or by late spring-sowing of wheat. The eggs are deposited in the wheat when it is coming into flower, and the larvæ abstracting the juices, cause the grain to shrivel. The perfect insect appears in June, when great numbers may sometimes be seen on wing in the evening, their chief time of activity. It is about one-tenth of an inch in length, pale ochreous or orange, downy, with large black eyes, and long slender legs; the male with very long antennæ. The antennæ of the male differ much in structure from those of the female, and are of twenty-five joints, whilst those of the female have only thirteen. The larvæ are small and lemon-colored. A little black ichneumon lays its eggs in the larvæ of the W., and is thus useful to the farmer by destroying it.—The name W. is also given to species of the genus *Chlorope* (see *COCK-FLY*) destructive to wheat.

WHEATON, Henry, American jurist and diplomatist, was born at Providence, Rhode Island, November 27, 1785, educated at Brown University; admitted to the bar in 1809; after which he spent several years in France, and six months in London, engaged in legal and literary studies. On his return to America, he resided in New York, where he contributed papers on International Law to the "National Advocate," a daily newspaper, and was appointed a justice of the Marine Court. In 1815, he published a "Digest of the Law of Maritime Captures or Prizes," which has been commended as one of the best works, in English, on the subject. About the same time, he published an "Essay on the Means of maintaining the Commercial and Naval Interests of the United States." In 1816, he was appointed Reporter of the Proceedings of the Supreme Court of the United States, a post he filled until 1837. His Reports, filling twelve volumes, a distinguished German has called "the Golden Book of American Law;" and it is considered by the legal profession as a work of extraordinary ability and value. He also made frequent contributions to the "North American" and "American Quarterly Reviews," and delivered addresses before literary societies. In 1825, he was engaged in revising the statute laws of New York; in 1826, he wrote his "Life of William Pinckney," of which he furnished an abridgment for Sparks's "American Biographies." In 1831, he was appointed *Chargé d'affaires* to Denmark, and resided at Copenhagen till 1835, when he was appointed Resident Minister at Berlin, and in 1837, Minister Plenipotentiary, which post he occupied with distinguished credit until 1846. In 1831, his "History of the Northmen" appeared at Philadelphia, London, and Paris; in 1836, his "Elements of International Law;" in 1841, his Essay, for which he received the prize of the French Institute, entitled "L'Histoire du Droit des Gens en Europe, depuis la Paix de Westphalie jusqu'au Congrès de Vienne," which, in 1846, was published, greatly enlarged, in Leipzig and Paris, and an English translation in New York. This work is a standard authority, and its author received the highest honors from the learned societies of Europe, and his own countrymen. Having retired from political life, he died at his residence at Dorchester, Massachusetts, March 11, 1848.

WHEATSTONE, Sir Charles, physicist and electrician, was born at Gloucester in 1802. From school he went to the making of musical instruments, and afterwards entered into business on his own account in London. But he was no ordinary manufacturer: the scientific principles involved in the construction of instruments occupied his thought; he made many improvements, and in 1823, he published a paper entitled "New Experiments on Sound." Endowed with remarkable ingenuity, he produced numerous models and apparatus to illustrate the phenomena of acoustics and of light, his attention having been drawn to the latter by the analogies between the two subjects. Few men have done so much towards enabling the student to apprehend the principles on which scientific theories are based, particularly those of the undulatory theory of light.

In 1833, Mr W. communicated his first paper, "On Acoustic Figures," to the Royal Society; followed, in 1834, by "Experiments to measure the Velocity of Electricity," in which, with a mirror revolving 800 times in a second, he demon-

strated the velocity at 288,000 miles in a second—greater than that of light. In the same year, he was appointed Professor of Natural Philosophy in King's College, London. In 1836, he was elected a Fellow of the Royal Society; and in a course of lectures at the College on the velocity above referred to, he anticipated the electric telegraph by experimenting through four miles of copper wire. In May 1837, a patent was taken out in the joint names of Cooke and W., "for improvements in giving signals and sounding alarms in distant places by means of electric currents transmitted through metallic circuits." From this instrument, which had five needles, has grown that system of electric telegraphs which now ramifies over the length and breadth of the United Kingdom. The first working-telegraph—insulated copper wires enclosed in an iron tube—was constructed on the Blackwall Railway in 1838.

To enumerate the titles only of Professor W.'s papers on scientific subjects, and describe his various inventions, would fill many pages: a few only can be indicated here. In a paper on Binocular vision laid before the Royal Society in 1838, he explained the principle of the stereoscope, an instrument of his invention: in 1840, he shewed that, by means of electro-magnetism, a number of clocks far apart might be kept going with absolute exactitude from one central clock; and in 1843, he brought out his new instruments and processes for determining the constants of a voltaic series. In 1840, and again in 1843, the Royal Society awarded him their Royal Medal—a high acknowledgment of the merit of his researches. For a long time after that date, scarcely a year passed without a paper on some recondite scientific subject, or some new invention, or improvement on former inventions, from the hand of Professor W., which heightened his reputation, and procured him substantial pecuniary reward. Among his inventions are his cryptograph; his automatic telegraph in two forms; his telegraph thermometer and barometer, by which an observer at the foot of a mountain could read the indications as shewn by the instruments on the summit; a machine for the conversion of dynamical into electrical force without the use of permanent magnets, by which large quantities of electricity can be produced at a cheap rate; and an apparatus for conveying instructions to engineers and steersmen on board large steam vessels.

Professor W. sat many times on the Council, and was a vice-president of the Royal Society. He was also a corresponding member of the leading foreign scientific academies, and in 1873 he was elected Foreign Associate of the science department of the Institute of France. In 1863, he received from her Majesty the honor of knighthood, and in the same year the Royal Society bestowed on him its Copley medal. He was made LL.D. in 1869 by the university of Edinburgh. He died in 1876.

WHEEL AND AXLE, the second of the Mechanical Powers (q. v.), is a modification of the Lever (q. v.). Its most primitive form is a cylindrical axle, on which a wheel, concentric with the axle, is firmly fastened. When employed for raising heavy weights, the weight is attached to a rope which is wound round the axle, and the power is applied either to a rope wound round the grooved rim of the wheel, or to a handle fixed at right angles to the wheel's rim (in the latter case, the wheel may be dispensed with, unless it is useful as a conservator of momentum [see FLY-WHEEL], and an ordinary winch substituted). The wheel and axle is neither more nor less than a lever, whose extremities are not points as in the normal form, but the circumferences of circles. Accordingly, the power and weight are not attached to particular points in these circumferences, but to cords wound round them, and when there is no wheel, but only a winch, the circumference described by the power in one revolution is substituted for the circumference of the wheel. The *capstan* and *windlass* are simple and common examples of this mechanical power, and combinations of toothed-wheels, or of wheels from one to another of which motion is communicated by an endless band, are compound illustrations of the same. See WINDLASS.

WHEEL-ANIMALCULE. See ROTATORIA.

WHEEL, Breaking on the, a very barbarous mode of inflicting the punishment of death, formerly in use in France and Germany, where the criminal was placed on a carriage-wheel, with his arms and legs extended along the spokes, and the wheel being turned round, the executioner fractured his limbs by successive blows with

an iron bar, which were repeated till death ensued. There was considerable variety in the mode in which this punishment was inflicted, at different times and in different places. By way of terminating sooner the sufferings of the victim, the executioner was sometimes permitted to deal two or three severe blows on the chest or stomach, known as *coups de grâce*; and occasionally, in France at least, the sentence contained a provision that the criminal was to be strangled after the first or second blow. Mercy of this kind was not, however, always allowed to be shown to the victims of the wheel: when Patkul, the envoy of Peter the Great, was put to death on the wheel by order of Charles XII. of Sweden, it is said that the officer in command of the guard was cashiered by the Swedish king in consequence of having allowed the head to be struck off before life was extinct in the mangled limbs. The punishment of the wheel was abolished in France at the Revolution; in Germany, it has been occasionally inflicted during the present c., on persons convicted of treason or parricide.

WHEELER, a genus of trees of the natural order *Leguminosæ*, sub-order *Papilionaceæ*. The wood of *W. ebenus*, a native of the West Indies, and of the tropical parts of America, is imported into Britain under the name of *American Ebony*. It is very hard, of a brownish-green color, takes a fine polish, and is employed by cabinet makers and musical instrument makers.

WHEELING, a city and a port of entry of West Virginia, U. S., on the left bank of the Ohio River, and both sides of Wheeling Creek, 40 miles direct, and 92 by river, below Pittsburg. The city is built at the foot of the hills, which rise to the Alleghenies, and is the terminus of the Baltimore and Ohio, and of the river division of the Cleveland and Pittsburg railways. The great national road here crosses the Ohio, over which is a wire-suspension bridge, 1010 feet long. The hills around the city are full of bituminous coal, which sells for 1d. a bushel. In 1864, there were 40 steamboats, numerous foundries, and other metallurgic works, glass-houses, paper-mills, flour-mills, breweries, tanneries, &c.; and 3 daily newspapers. Pop. in 1870, 19,380; in 1880, 30,737.

WHEEL-WORK. The arrangement for conveying motion from one axis to another by means of toothed wheels, is familiar to every one; it has been in use since the days of Archimedes, and was in use, probably, for many centuries before; but it is only in modern times that the action of such wheels has been critically examined and understood. To a superficial observer, the action appears to be extremely simple: a tooth of the driver pushes against a tooth of the driven wheel, thereby causing that wheel to turn round; and, since by this turning the teeth must become disengaged, it is requisite that, before one tooth let go, a second tooth of the driver be ready to take hold of another tooth of the driven wheel. For this purpose, it is enough that the distances between the teeth on the two wheels be alike; in other words, that the diameters be proportioned to the number of the teeth.

When two unequal wheels act upon each other, the smaller one turns faster than the larger. Thus, if a wheel with 60 teeth work into one of 20, the latter will turn 3 times as quickly as the former; and it is on this principle that the trains of clock-work are arranged. For example, the *great-wheel* of a common house-clock may have 180 teeth, and may drive a smaller wheel, or *pinion* as it is called, of 15 leaves, and in this case, if the great-wheel turn once in 12 hours, the pinion must turn once in every hour; the axis of this pinion carries the minute-hand. On the same axis the *hour-wheel* is fixed, which may have, say, 96 teeth, and may drive a pinion of 12 leaves. This pinion, then, must turn 8 times per hour, or once in 7½ minutes. On the same axis with this last-mentioned pinion there is fixed the *third-wheel*, having, perhaps, 75 teeth, and this drives a pinion of 10 leaves, which, turning 7½ times as fast, must make one turn per minute. On the axis of this last pinion the *escape-wheel* is fixed. This escape-wheel has 80 teeth, each tooth acting twice upon the pendulum, thus making 60 beats per minute. In such a case as this, there is no difficulty in arranging the numbers of the teeth, and these may be varied in many ways, provided the proper proportions be kept. But in other cases, a considerable amount of skill, and often a great deal of labor, is required for the discovery of the proper numbers. Thus, if it be wished to indicate the moon's age on the dial of a clock, we must have an index turning once in the time between new moon and new moon. This time, which astronomers call a *lunation*, averages 29 days, 12 hours, 44 minutes, and nearly 5 seconds (2-853), and it is by no means an easy

matter to find out what number of teeth will produce this motion. The month-wheel would need to turn rather more than 59 times as slowly as the great-wheel of the clock; and if the mean lunation had been $29\frac{1}{2}$ days, without the odd 44 minutes, the thing could have been managed by making a pinion of 8 teeth lead a wheel of 59 teeth, on the axis of which another pinion, say, of 10 teeth, is fixed, and made to work a wheel of 50 teeth. But then such an arrangement would go wrong nearly three quarters of an hour every month, and in three years would indicate a new moon a day too early. In order to obtain a better train, we may compute the number of days in 2, 3, 4, 5 lunations until we get nearly a number of half-days. Now, 16 lunations consist of 472 days, 11 hours, 45 minutes, or almost exactly 945 turns of the great-wheel. This proportion can be obtained by causing a pinion of 12 teeth to lead a wheel of 81 teeth, and another pinion also of 12 to lead a wheel of 105 teeth. This arrangement gives an error of one quarter of an hour in 16 months, or hardly an hour in five years. If still greater precision be required, we must carry the multiples further: 35 lunations make 974 days, 12 hours, 18½ minutes, or 1949 turns of the great-wheel of the clock; but then this number 1949 has no divisor, and it is quite impracticable to make a wheel of 1949 teeth; so that we must continue our multiples in search of a better train. In this way, when great exactitude is desired, we often encounter an unexpected amount of labor. For reducing this labor, the method of continued fractions is employed, and the toil is further lessened by the use of tables of divisors.

Such calculations have to be made for the construction of orreries, by which the times of the revolutions of the planets are shewn; and engineers have to make them, as when a screw of a particular pitch has to be cut. If, for instance, we have to cut a screw of 200 turns to the French metre on a lathe having a leading-screw of 4 turns to the English inch, the axis of the lathe must make 50 turns while the screw makes 89 and a fraction, since the metre is $89\cdot27079$ inches. By applying the method of continued fractions, we discover that, for 2225 turns of the lathe-spindle there must be 1752 turns of the screw; and as these numbers can be reduced into products—viz., 2225 into $5\times5\times89$, and 1752 into $2\times2\times3\times3\times78$, we can easily get trains to produce the desired effect. From these illustrations, it is apparent that the computation of the trains of wheel-work is intimately connected with the doctrine of prime and composite numbers.

The general sizes of the wheels and the number of the teeth having been fixed on, the next business is to consider the shape which those teeth ought to have. Now, for the smooth and proper action of machinery, it is essential that the uniform motion of one of the wheels be accompanied by a motion also equable of the other wheel. Two curves have been known to give this quality of equable motion, viz., the epicycloid, formed by rolling a circle upon another, and the involute of the circle traced by the end of a thread which is being wound upon a cylinder, or unwound from it. But the general character of all curves which possess this property has been only lately examined. If it were proposed to construct two wheels which shall have their centres at the points A and B, and the one of which may make 5 turns while the other makes 8, we should divide the distance between centres into 8 parts, and assign 5 of these for the radius of the one wheel, the remaining 3 parts for the radius of the other wheel. Wheels made of these sizes, and rolling upon each other, would turn equably, and if the circumferences be divided into 5 and 8 parts respectively, the points of division would come opposite to each other as the wheels turned. The circumferences of these circles are called the *pitch-lines*, and the portions of them included between two teeth is called the *distance of the teeth*: the distance, or arc CD, on the one wheel must be equal to the distance CE on the other wheel, in order that the motion may bring C and E together. For a reason that will appear in the sequel, we cannot use wheels with so few as 3 or 5 teeth, and therefore

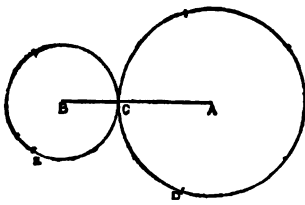


Fig. 1.

appear in the sequel, we cannot use wheels with so few as 3 or 5 teeth, and therefore

we subdivide the distances CD and CE into some number of parts, say 4, and thus obtain wheels of 20 and 12 teeth instead. Since the tooth of the one wheel must necessarily come between two teeth on the other, the distance between the teeth must be halved, the one half being given for tooth, and the other half for space.

Having then divided off the pitch-line of the wheel B , as in fig. 2, CD being the distance of the teeth, CG the half-distance, let us sketch any contour, $CFGHD$, for the shape of a tooth, and let us examine what should be the characters of this outline. In the first place, the form of this outline must be repeated for each tooth; and in the second place, the line should be symmetric from the top, F , of the one to the top, I , of the next tooth, in order that the wheel may be reversible face for face. These obvious conditions having been attended to, let us cut, in thin sheet-brass or other convenient material, a disc having this outline, and let us pin its centre at the point B . Having prepared a blank disc on which the outline A is to be traced, let us slip it under the edge of the previous one, and pin its centre at the point A . If now, B and A being held fast, we trace the outline of B upon A , we move each of them slightly, but in the proper proportion forward, and make a new trace upon A , and so continue as far as needed, we shall obtain a multitude of curve lines marked upon A . The line which envelopes and touches all these curves is, obviously, the proper outline for the wheel A ; and thus it appears, that whatever outline, within reasonable limits, may have been assumed for the teeth of B , it is always possible by a geometrical operation, to discover the proper corresponding form for the teeth of A . These forms may be called *conjugate* to each other, inasmuch as, that if the disc A were now cut out and used as B has been, the identical form of B would be reproduced.

We may obtain a whole series of wheels, A , A' , A'' , &c., from the same original B ; and from A , as an original, we may obtain another series, B , B' , B'' , &c., having various numbers of teeth. And it has been shewn that any wheel of the series A will work accurately along with any one of the series B . So far well; but then the wheel A of 20 teeth may not be like the wheel B of the same number of teeth. It becomes, therefore, a desideratum to choose the form of the teeth of B in such a manner that its conjugate of the same number of teeth may have the same form; by such an arrangement, we shall obtain a series of wheels, any one of which will work with any other.

If the number of the teeth of B be augmented indefinitely, the outline of the pitch-line will become nearly straight; and so drawing through C (fig. 3) a straight line to touch the pitch-line of A , we shall have the pitch-line of the straight rack, as it is called, which could be worked by any wheel of the series A . The reverse of this rack would work with any one of the series B , and therefore, if the series A and B be identical with each other, the rack must be its own reverse. Thus we obtain a very important general result—viz., that if we mark off along a straight line distances, CD equal to the desired interval between the teeth, and then draw any line, $CKLMD$, consisting of four equal parts, CK , KL , LM , MD , symmetrically arranged, all the wheels obtained from this, as the original, will work into each other; and, moreover, the forms thus obtained answer for internal as well as external teeth.

Being then at liberty to choose any line whatever, subject to the above condition of symmetry, for the figure of the straight rack, we may inquire whether it may not

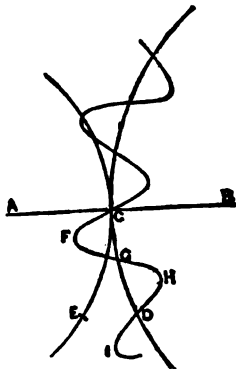


Fig. 2.

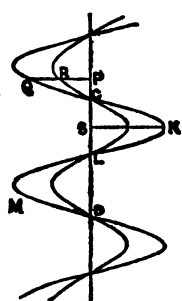


Fig. 3.

be arranged so as to bring about other desiderata. This line, it may be noted, is not necessarily curved; it may be composed of straight lines, or partly of straight and partly of curved lines.

The general appearance of this wavy line recalls that curve known as the curve of sines, which, indeed, is the simplest known curve, consisting of equal and symmetric undulations, and unlimited in extent. By changing the ordinates in any ratio, say in the ratio of PQ to PR, the waves of the curve may be made shallower or deeper; and on studying the effects of such a change, we discover some new and very important laws concerning the contacts of the teeth of wheels.

Beginning with the curve of sines proper, in which the greatest ordinate, SK, is equal to the radius of a circle of which CD is the length of the circumference, it is found that wheels traced from it only touch each other at one point; of course such wheels cannot work, because the solitary contact is now on the back and now on the front of the tooth. In this case, the contour of the tooth crosses the pitch-line at an angle of 45° . On deepening the teeth, still keeping to the same kind of curve, it is found that the wheels begin to touch at more points than one; and when they are made so deep as that the contour crosses the pitch-line at an angle of 65° , there are always three contacts, neither more nor less. If the teeth be still further deepened, the contacts become more numerous; they appear and disappear in pairs, so that with an inclination of, say 68° , there would be sometimes three, and sometimes five contacts. When it becomes $70^\circ 17'$, there are always five; and with an inclination of $78^\circ 11'$, there are always seven points in contact at once.

Of these points of contact, some are on the sides of the teeth, and others are near the top and bottom; the latter, on account of the obliquity of their action, are of no use in driving; they may be called supplementary, and their number is always one less than the number of useful or working contacts. In the system of seven contacts, four are useful, two of them being forwards, and two backwards, so that two teeth are always in action at once; an arrangement by which a gradual improvement in the equality of the teeth is secured by their wearing.

When two properly formed wheels are put in motion, the points of contact move also, and describe a peculiarly shaped line, the nature of which depends on the character of the primary form adopted for the tooth of the straight rack. Conversely, if this path of the points of contact be first assumed, and the law of motion in it be observed, the form of the tooth of any wheel may thence be obtained.

In well-constructed machinery, there should never be fewer than seven contacts in the system, since of these only four are working; and therefore only two teeth are fully engaged; and it is necessary that two teeth be engaged at once, in order that the wearing may tend to remove any unavoidable inequalities of workmanship.

When we attempt to delineate the forms of wheels with few teeth by help of any of these orbits, we find that the contours overlap each other; in such cases, the following tooth of the conjugate wheel effaces, as it were, the trace belonging to the preceding tooth; and the contacts, though still holding good of the geometrical curves, become mechanically impossible. Thus it is that there are limits below which we cannot go in the numbers of the teeth. If the overlapping occur at the shoulder of that tooth, some of the useful contacts are wanting; but when the replication is only at the point of the tooth, the want of the supplementary contact occasions no inconvenience. An examination of the different cases shows that with seven contacts, the smallest numbers which can be used on the three systems just mentioned are 19, 17, and 11, so that the system of epicycloidal teeth has, in this respect, the advantage over the others. Clock pinions, then, should not have fewer than eleven leaves.

This method of considering the subject was first published by the writer of this article in "A New General Theory of the Teeth of Wheels" (Edinburgh, 1853).

It remains to cut the actual wheel to the shape thus formed. The essentials of the operation are these: The blank wheel is attached to the axis of a large divided circle, which can be turned round and held in any desired position. A cutter, generally a revolving cutter, is brought down upon the blank, so as to notch out the space between two teeth; this done, the circle is turned round by the proper number of divisions, and another space is cut, and in this way the whole circumference

of the wheel it goes over. In order that the work be well done, it is essential that the cutter be truly shaped; and when the edges get blunted by use, it is no easy matter to avoid spoiling the shape in the resharpening. Whatever system be followed, the form of the tooth varies from one number to another, so that the cutter which answers for a wheel of 20 cannot do for one of 80 teeth; and hence, when accurate results are wanted, there must be a cutter for each wheel. In order to avoid the expense of so many cutters, each requiring to be carefully made, the slovenly practice is too often followed of having, perhaps, two cutters, one to be used for pinions, the other for wheels; and the result is the intolerable noise which is so common in mills, and which, if properly understood, should be taken as an indication of unnecessary expenditure of power.

When, as in the wholesale manufacture of clocks and watches, multitudes of wheels are to be cut of one size, careful attention can be given to the shape of the cutter. The labor is economised by binding a considerable number of blanks together on the dividing engine, and ploughing out the teeth of the whole of them at once. For the small wheels, technically called pinions, which cannot conveniently be fixed on the dividing-engine, *pinion-wires* are used; these are wires of brass or steel drawn through holes of the proper shape, and having the leaves running all along them. The watchmaker removes the leaves from those parts where they are not wanted, and thus obtains the pinion and its axle in one piece; in this way he gains the advantages of solidity and economy of workmanship.

Among the many purposes to which wheel-work is applied, it sometimes happens that an unequal motion is wanted. Thus, in the construction of an orrery, it is desirable that while one index turns uniformly to shew the time, another may turn so as to shew the unequal motion of the sun in the ecliptic. In that case, the variations of the velocity are small, and it is enough to divide the teeth unequally, as the slight inequality can hardly affect the working of the apparatus. But when the changes of velocity are considerable, the matter must be more carefully looked into. If we suppose the pitch-lines of two wheels to be uneven, and to roll upon each other without regard to the positions of their centres, the forms of teeth to be arranged upon those pitch-lines may be traced out almost in the same manner already explained for round wheels. The pitch-line must be divided into equal distances, and the disc must receive a half-sliding half-turning motion, so that the pitch-line may pass through the point C (fig. 5) always perpendicularly to the line AB, which is the line of centres for round wheels. The combination of this motion with the proper motion of the points of contact gives true forms for the teeth.

Thus, the form of the tooth can be obtained when that of the pitch-line is known.

Now, when two discs, turning on fixed centres, touch each other at any point out of the straight line joining these centres, there is a slipping of the one surface over the other; and therefore, in order that the pitch-lines may roll together, they must be so shaped as that the point of contact may be in the line of centres. It can be shewn that, for any assumed contour of the wheel A, another contour having its centre at B, and rolling upon A, is possible. But, except in one or two special cases, the working out of the problem has not been accomplished. It will be enough here to mention the single case of elliptic wheels. The action of these is founded on the well-known property of the ellipse, that the sum of the distances of any point in it from the two foci is constant, and that the curve makes equal angles with these two lines. Hence two equal ellipses turning on their foci, when their centres are at a distance equal to the major axis of the ellipse, will roll upon each other; and teeth formed upon these as pitch-lines will work perfectly.

Sometimes one of the wheels has to be quite at rest during part of the motion

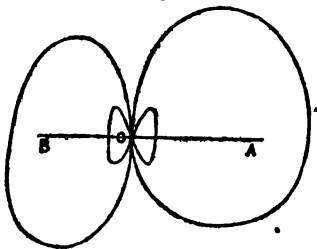


Fig. 4.

Wheel
Whewell

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of the other wheel. This is accomplished by causing some part of the wheel that is to be stationary, to bear upon a part of the circumference of the moving-wheel which is concentric with its axis. Another example of this kind of interrupted motion is seen in the ordinary dead-beat clock escapement, in which the detaining surface of the pallet is concentric with the axis of the crutch.

When the axes are inclined to each other, *bevelled* wheels are used. Just as common wheels may be regarded as fluted cylinders, bevelled wheels may be described as fluted cones having a common apex. The principles which regulate the formation of the teeth of these are the same as for plane wheels; but the application of these principles is considerably more intricate. Since both the teeth and the spaces between them are tapered, it is impossible to notch out the intervals by means of a revolving cutter. Attempts have been made to construct machinery for planing the teeth by means of a cutter moving in a line towards the apex of the cone, but the complexity of the apparatus, and the slowness of the process, have prevented its introduction; and thus the accurate formation of bevelled wheels has still to be accomplished by hand.

WHELK (*Buccinum*), a genus of gasteropodous molluscs, of the family *Buccinidae*. The shell is ovate, turrit, and more or less ventricose; its mouth ovate, emarginate, or produced into a very short canal below, the outer lip expanded, the inner lip usually thin and smooth within. The operculum is horny. The animal has a broad head, with two tentacula, with the base of which the stalks bearing the eyes are united; the proboscis is large, and the tongue armed with teeth, which are used for the purpose of rasping substances used for food—almost any animal substance being welcome for this use—or for perforating the shells of other molluscs in order to prey upon them. There are about twenty known species, chiefly found on the coasts of the colder parts of the world. The British coasts produce several species, of which the most abundant is the Common W. (*B. undatum*). It occurs from low-water mark to a depth of 100 fathoms, is sometimes three inches in length, grayish or brownish white, with numerous raised ridges and spiral striae. It is very widely distributed in the northern parts of the northern hemisphere, and is one of the most common molluscs of the arctic regions. It is much used as an article of food, is cooked simply by boiling, and is generally eaten with vinegar and pepper. Great quantities are consumed in London, chiefly by the poorer classes. In former times, whelks would appear to have been more highly esteemed than now. Eight thousand of them were provided for the enthronisation feast of William Warham, Archbishop of Canterbury, in 1504. Yet on some parts of the British coasts, as on those of Scotland, whelks are never eaten, a prejudice existing against them as unsuitable for food. The whelks brought to the London market are mostly obtained by dredging. On the coast of Galloway, where they are used as a bait for catching cod, they are procured by letting down baskets containing pieces of fish in about ten fathoms water. The baskets being taken up next day, are found to contain many whelks which have crept into them to feed on the garbage. The name W. (or *Wilk*) is popularly given in Scotland to the Periwinkle, the W. being known by that of *Buccia*. There are more than 100 fossil species of W. in the Miocene formations.

WHELK, or *Bubac*. These are terms used by the older English writers, and by Dr Crigie in recent times, to signify the cutaneous disorder now commonly known as *Aene*. The simple whelk, the black whelk, the liverate whelk, and the crimson whelk, correspond to *Aene simplex*, *A. punctata*, *A. indurata*, and *A. rosacea* of the more modern dermatologists. The symptoms of the crimson whelk, or scurfy-face, must have been carefully observed by our great dramatist before he could have written Fluellen's graphic description of Bardolph: "His face is all bubukles, and whelks, and knobs, and flames of fire, but his lips plows at his nose; and it is like a coal of fire, sometimes blue, and sometimes red."—"King Henry V.," act III. sc. vi. The *Chin-whelk* is the old name for the affection now known as *Sycosis* or *Montagra*.

WHEWELL, William, D.D., was born in 1795 at Lancaster. His father intended him for his own trade—that of a joiner; but the boy having excelled at school in mathematics, was persuaded to go to Cambridge. He entered at Trinity College, and graduated (Second Wrangler, and Second Smith's Prize-man) B.A. in 1816. He became a Fellow, and afterwards a Tutor of Trinity, where also, for many years, he acted as a successful "coach," or private tutor. In 1820, he became a Fellow of the

Royal Society. Between 1836 and 1838, he was Professor of Mineralogy in Cambridge; and between 1838 and 1855, Professor of Moral Theology, or Casuistry. In 1841, he was appointed Master of Trinity; and in the same year, he was President of the British Association at its meeting at Plymouth. He was also, for a time, President of the Geological Society. In 1855, he became Vice-chancellor of the university of Cambridge. He died at Trinity (1866), in consequence of injuries sustained through a fall when riding.

W., when he acted as a private tutor, produced several text books on mathematical subjects (one of which, his "Dynamics," 1828, is deservedly admired), which were for a time popular, but may now be said to have been superseded. He also contributed a variety of papers to the Transactions of learned and scientific societies, and to scientific journals, and to the reviews. In some of these, he treated of such subjects as the Tides, Electricity, Magnetism, and Heat; in others, of abstruse and recondite subjects, literary, historical, and metaphysical. Later in life, while he continued to write papers of this class, he concentrated his powers mainly on the production of large works. Among the most important of his books are—"Astronomy and General Physics considered in Reference to Natural Theology," being the third Bridgewater Treatise (Lond. 1833); "History of the Inductive Sciences, from the Earliest to the Present Times" (3 vols., Lond. 1837); "The Philosophy of the Inductive Sciences, founded upon their History" (2 vols., Lond. 1840); "The Elements of Morality, including Polity" (Lond. 1855). Among his other works are—"The Plurality of Worlds," which had considerable popularity from its subject; "The History of Scientific Ideas," "Novum Organum Renovatum;" "Notes on the Architecture of German Churches;" "Lectures on the History of Moral Philosophy in England;" "Indications of the Creator;" translation of Goethe's "Herman and Dorothea;" translation of Auerbach's "Professor's Wife;" translation of Grotius's "Rights of Peace and War;" a translation of Plato's works; and "The Platonic Dialogues for English Readers." Besides these books, he published many essays, as yet uncollected. His last composition, so far as is known, is an attack on Comte and Positivism, which appeared in "Macmillan's Magazine" after his death.

W.'s acquisitions were most various; it would have been sufficient occupation for the lives of most bookworms to have made them. His writings, again, were so various and voluminous, it might be thought sufficient employment of the life of a mere clever bookmaker to have produced them. W. was neither bookworm nor bookmaker. A clear-headed student, he was always increasing his stock of knowledge; a vigorous and independent thinker and writer, he was always giving forth the results of his studies to the public; and having thus proceeded during a long life of almost uninterrupted good health, he may be taken as illustrating what at the best may be achieved by a man of ambition, ability, and unflagging industry, without genius. He was nowhere superficial, like many pretenders to encyclopædic knowledge; he was really master of all that could be learned on a great many subjects. It has been said of him, "knowledge was his forte, omniscience his folie;" but it is absurd to suggest that a man can have and strain after too much knowledge, if it be, as his was, thorough knowledge. His chief ambition was to grasp, survey, and co-ordinate the sciences; and he did excellent service both to science and history in the effort to gratify it. The task suited one of his extraordinary acquisitions, good sense and philosophic comprehension. Had he been a man of more imagination and ingenuity, he might, of course, have been better employed in endeavoring to advance some single science. As he was, this was beyond him: he made some original investigations; but the results must be pronounced unimportant.

W. was a large, strong, erect man, with a red face and a loud voice. He was an effective preacher and lecturer, though in both characters wanting in that "something" which wins and rivets the hearer. He was accused of being arrogant; and his general bearing gave color to the charge. A story, long current, may be told as illustrating at once his varied knowledge and his personal relations to his brother Fellows. He used so to overwhelm with his learning the company at the Fellows' table and in the Combination Room, that a conspiracy was formed to put him down. Some of the Fellows got up a knowledge of Chinese music from scattered articles in old reviews, with which they presumed he would be unacquainted. They then made Chinese music the

subject of, as it were, a casual conversation at table. For a time, contrary to his usual habit, he took no part in the conversation. When they had about exhausted themselves, however he remarked: "I was imperfectly, and to some extent incorrectly, informed regarding Chinese music when I wrote the articles from which you have drawn your information." They were caught in their own trap, and had, as on other occasions, to submit to be instructed.

WHEY. When any substance, possessing the property of coagulating casein, is added to milk, the coagulated casein separates in flakes and clots, and sinks to the bottom, constituting what is termed the *curds*; while the supernatant, straw-colored fluid is known as the *whey*. Cheese-making affords the principal source of whey, which, thus obtained, forms, like butter-milk, a very valuable kind of drink. The whey of goats' milk is regarded as especially beneficial, and in Switzerland and elsewhere, large establishments have been set up for carrying out the *whey-cure*, either alone or in association with the grape-cure. There can be no doubt that, were the cases judiciously selected, much good in the way of eliminating morbid matter, might be effected in a few weeks by confining the patients to a diet of brown bread, grapes and whey; while on the other hand, many diseases might be much aggravated by that treatment. In ordinary medicine we recognise several useful varieties of whey, as: White-wine whey, prepared by the addition of sufficient sherry to a tumbler of heated milk to coagulate the casein. On decanting off the whey from the curds, and sweetening, we obtain a favorite sudorific draught, which may be taken with advantage as a sudorific at bedtime, whenever there is a threatening of incipient cold in the head. *Cream of tartar whey* and *nitre-whey*—the former prepared by boiling 100 grains of cream of tartar in a pint of milk, and the latter by the similar use of nitre—act in the same way as wine-whey, but more powerfully. *Tamarind whey* has been already described in the article on that fruit.

WHIG AND TORY, the names which for the last two centuries have been popularly applied to two opposite parties in Great Britain. Both were at first names of reproach. *Whig* was originally a nickname of the peasantry of the Western Lowlands of Scotland, said by some to be derived from a word or sound used by them in driving their horses; by others, from *whig*, an "aceticous liquor subsiding from sour cream."—*Jamieson*. Its next application was to the bands of Covenanters, chiefly from the west of Scotland, who, subsequently to the murder of Archbishop Sharpe, took up arms against the government, and after gaining some successes in encounters with the king's troops, were defeated at Bothwell Bridge. Thence the name Whig (or Whigamore) came to be fastened, first, on the whole Presbyterian scots of Scotland, and afterwards on those English politicians who shewed a disposition to oppose the court, and treat Protestant nonconformists with leniency. The word *Tory*—said to be derived from *tora*, *tora*, in Irish "give, give," or "stand and deliver"—was first given to certain bands of outlaws, half-robber, half-insurgent, professing the Roman Catholic faith, who harassed the English in Ireland; and was thence applied reproachfully to all who were supposed to be abettors of the imaginary Popish plot; and then generally to persons who refused to concur in the exclusion of a Roman Catholic prince from the throne. These two nicknames, which came into use about 1680, immediately became familiar words, and have since been retained as designations of two opposite political sides—the Tories being, generally speaking, the adherents of the ancient constitution of England, without change, and the supporters of regal, ecclesiastical, and aristocratic authority; while the whigs have been the advocates of such changes in the constitution as tend in the direction of democracy. The most sweeping constitutional change of the present century which the Whigs have carried is the Reform Bill of 1832. Each party, while preserving within certain limits a general consistency of purpose, has undergone many changes in its principles, professions, and modes of action with the altering circumstances of the country; and among persons who have been considered adherents of each side at any given time, there have seldom been wanting a variety of more or less distinctive shades of opinion. A division in the ranks of either party has often led the more moderate section of that party to coalesce with the opposite side; and at other times, the extreme party of innovation, dropping their connection with the Whigs, have adopted another name, as when those politicians whose desire was to have the whole institutions of the country remodelled

on a democratic basis, assumed the designation of *Radical Reformers* or *Radicals*. See also **CHARTISM**. For a considerable time after the Reform Bill, the governing section of the Whig party were more disposed to maintain the principles of the changes already made, than to insist on further constitutional changes; and the principles maintained by Whigs and Tories sometimes approximated so closely that the difference seemed more one of men than of measures. Sometimes one party, sometimes the other, has appeared as the advocate of measures which have proved beneficial. In the agitation for the repeal of the Corn-laws, which lasted from 1841 to 1846, the Tories were ranked on the side of protection, and the Whigs of free trade; but the relations of the two parties had been the reverse at a former period, when Mr Pitt's advocacy of free trade between England and Ireland was opposed by the manufacturers of Lancashire, who succeeded in getting his measure postponed. During the last thirty years, the names *Liberal* and *Conservative* have to a great extent superseded the former party designations of Whig and Tory.

WHIMBREL (*Numenius phaeopus*), a bird of the same genus with the Curlew (q. v.), and much resembling it in form, plumage, and habits, but of smaller size, and with a bill considerably shorter in proportion. The female, which is larger than the male, is about eighteen inches in length, the bill being about three inches and a half. The plumage of the W. is of a bright ash color, with streaks of brown on the neck and breast. The W. is a very widely distributed bird, being found from the north of Africa and of India to the arctic regions of Europe and Asia. It occurs also in Japan. It is a bird of passage, and visits Britain chiefly in the course of its spring and autumn migrations. A few whimbrels breed in Shetland; but the number is diminishing, the eggs being in great request as a delicacy. The flesh is also highly esteemed.

WHIN. See **FURZE**.

WHIN-CHAT (*Saxicola rubetra*; see **CHAT**), a bird very similar to the Stonechat (q. v.), a summer visitant of Britain and of the northern parts of Europe. It is widely diffused over the British islands in summer, but nowhere very abundant. The head, sides of the neck, and upper parts of the body are blackish brown, each feather bordered with rusty yellow; an elongated streak of white above each eye; the throat and a streak on each side of the neck white; the breast, rust-color; a large white spot on each wing; the tail white, except the two middle quills and the tip, which are blackish brown. The colors of the female are less distinct than those of the male. The W. frequents furze (or whin) bushes. Its song is pleasant.

WHINSTONE (probably from the same root as *whina*, and meaning the sounding, ringing stone), a name popularly given in Scotland to any hard and compact kind of stone, as contra-distinguished to sandstone or freestone, and rocks of slaty structure. Thus, in most parts of Scotland, it is the common appellation of basalt, greenstone, and other trap rocks, whilst in some districts it is applied to granite.

WHIPPING. Corporal punishment by whipping, public as well as private, was formerly often awarded by the criminal law of England for minor offences, such as petty larceny, and was not unfrequently superadded to some other punishment, such as imprisonment or the pillory. In early times, and by the usage of the Star Chamber, whipping could not be competently inflicted on a gentleman.—In Scotland, sentence of whipping was also frequent, the terms of the sentence sometimes requiring it to be repeated at intervals and in different parts of the kingdom. In the last century, the Scottish burgh magistrates were in the habit of awarding sentence of whipping on summary convictions for police offences, such as brawls, street outrages, and the keeping of disorderly houses; but in modern practice the competency of inflicting this sentence at common law without the intervention of a jury had been made matter of doubt. Whipping used not long since to be an occasional addition to the sentence of the Judiciary court on persons convicted of aggravated assaults.

The infliction of corporal punishment by whipping on women was prohibited by act 1 Geo. IV. c. 57. In Act 5 and 6 Vict. c. 51, directed against attempts to injure

or alarm the Queen by discharging fire-arms in her Majesty's neighborhood, or otherwise, the infliction of public or private whipping not exceeding three times is made part of the punishment. Act 26 and 27 Vict. c. 44 (not applicable to Scotland) authorises whipping in addition to penal servitude in convictions for robbery, assaults with intent to rob, and attempts to strangle or render insensible with the view of committing a crime, the number of strokes not exceeding 50 in the case of an adult, or 25 in the case of a boy under 16. Recent legislation, both in England and Scotland, has made various provisions for the infliction of this description of corporal punishment on juvenile culprits. Whipping of boys under 16 for various offences is authorised by the English Criminal Consolidation Act (1861); it being provided that the whipping is to be private, and not repeated more than once, and the instrument of punishment to be specified in the sentence. Similar provisions, with some additional ones, occur in 25 Vict. c. 18 as to the mode in which the same punishment is to be administered on summary convictions by justices. In Scotland, the Prisons Amendment Act, 14 and 15 Vict. c. 27, and the act 23 and 24 Vict. c. 106, which superseded it, authorise the whipping of boys under regulations made by the Lord Advocate, and approved by the Secretary of State. By act 25 Vict. c. 18, no person above the age of 16 can now be whipped in Scotland for theft, or any crime against person or property. It is a very general impression among magistrates that whipping to the moderate extent allowed by 26 and 27 Vict. has had a most salutary effect in repressing certain kinds of outrage, the apprehension of mere imprisonment, or even of penal servitude, having little efficacy in the way of prevention. Thus, personal chastisement, the oldest form of punishment for crime, has to a certain extent been resumed in the administration of the criminal law.

As regards corporal punishment in the army and navy, see **FLOGGING**.

WHIP-POOR-WILL (*Caprimulgus* or *Antrostomus vociferus*), a species of Goatsucker (q. v.), a native of North America, common in the eastern parts of the United States. It receives its popular name from the fancied resemblance of its notes to the words *Whip poor Will*. It is about ten inches long, the plumage very like that of the European goatsucker, much mottled and indistinctly marked with small transverse bands, the top of the head streaked with black, a narrow white collar on the throat. The bristles at the base of the bill are very stiff, and more than an inch long. This bird is seldom seen during the day, but seeks its food by night, catching moths, beetles, and other insects on the wing. Its flight is near the ground, zigzag, and noiseless. Its notes are heard only during the night, and are clear and loud, so that when a few of these birds are close at hand, the noise is such that those unaccustomed to it cannot sleep. In the more southern parts of the United States, the W. is replaced by a larger species, the Chuck-Will's-Widow (q. v.), and on the Upper Missouri and to the west by a smaller one (*C. or A. Nuttalli*).

WHIRLPOOL, a circular current in a river or sea, produced by opposing tides, winds, or currents. It is a phenomenon of rare occurrence on a large scale, but illustrations in miniature may be noticed in the eddies formed in a river by means of obstacles or deflections. The two celebrated sea-whirlpools, Charybdis (see **SCYLLA**) and Maelström (q. v.) are now known to be merely "chopping seas," caused by the wind acting obliquely on a rapid current setting steadily in one direction while the tide is flowing, and in the opposite direction when it is ebbing. During calm weather, neither of these so-called whirlpools is dangerous for large ships, but when the current and the wind are strongly in opposition, the broken swell is so violent and extensive in the Maelström as to founder large ships, or drive them against the rocks. Though in neither of these two cases, formerly so much dreaded, is there any vortical action, instances of such action do actually occur in various localities, as in the whirlpool of Corrieveikin (q. v.) and in some eddies produced by opposing winds and currents among the Orkney Islands.

WHIRLWINDS AND WATERSPOUTS. Whirlwinds differ in many respects from the storms described in the articles **STORMS** and **TYPHOONS**. They seldom continue longer than a minute at any place, and sometimes only a few seconds; their breadth varies from a few yards to nearly a quarter of a mile; during their short continuance, the changes of the wind are sudden and violent; and the barometer is not observed to fall. The direction of the eddy of the whirlwinds, especially when the diameter is very small, differs from the rotation of winds in a storm, in

that it may take place either way—right to left, or left to right—according to the direction of the stronger of the two winds which give rise to the whirlwind. Thus, suppose it to arise from a north wind blowing side by side with a south wind, and to the west of it, then, if the north wind be stronger, the whirl will be north, west, south, and east; but it will be in a contrary direction if the south wind be the stronger. Whirlwinds often originate within the tropics during the hot season, especially in flat sandy deserts; these becoming unequally heated by the sun, give rise to ascending columns of heated air. In their contact with each other, the ascending currents result in eddies, which draw up with them large clouds of dust, and the whole is borne forward by the wind that may happen to be blowing at the time. This is the origin of the *dust whirlwinds* of India, which have been admirably described and illustrated by P. F. H. Baddeley. These dust-storms are frequent in dry warm regions; and in the case of the *Simoom* (q. v.), which may be regarded as a succession of such whirlwinds, they appear on a scale of the most appalling grandeur.

Extensive fires, such as the burning of the prairie in America, and volcanic eruptions, also cause whirlwinds, by the conflicting currents of heated air they occasion; and these, as well as the whirlwinds already mentioned, are generally accompanied with heavy rains, hail, and electrical displays. Whirlwinds are also of frequent occurrence in France, doing great damage to the vineyards and other crops; but in Great Britain they seldom occur.

Waterspouts are whirlwinds occurring on the sea or on lakes. When fully formed, they appear as tall pillars of cloud stretching from the sea to the sky, whirling round their axes, and exhibiting the progressive movement of the whole mass precisely as in the case of the dust-whirlwind. The sea at the base of the whirling vortices is thrown into the most violent commotion, resembling the surface of water in rapid ebullition. It is a popular fallacy that the water of the sea is sucked up in a solid mass by water-pouls, it being only the spray from the broken waves which is carried up. Observations of the rain-gauge conclusively prove this.

What are sometimes called *waterspouts on land* are quite distinct from these phenomena. They are merely heavy falls of rain of a very local character, and may or may not be accompanied with whirling winds. They generally occur during thunder storms, being quite analogous to severe hail storms, from which they differ only in point of temperature. Also all the moisture that falls is the result of condensation; whereas, in the true water-pout, the rain is mixed with spray which has been caught up from the broken waves, and carried aloft by the ascending currents of the whirlwind.

WHISKY (Gaelic, *uisge*, water; *uisge-beatha*, commonly written *usquebaugh*, water of life), a spirit made by distillation from grain, roots, and other materials, the best being produced from barley after it has been malted, though what is termed raw grain whisky (made from wheat, oats, rice, rye, Indian corn, buckwheat, millet, &c.), after being kept for two or three years, is scarcely inferior in quality. W. is also made from beetroot, potatoes, beans, molasses, sugar, &c. In these cases, malt is used to a small extent. The mode of manufacture is described under DISTILLATION. W. was formerly almost exclusively manufactured in Scotland, Ireland, and the United States; but distilleries are now at work largely in England, Prussia, Sweden, France, Holland and Belgium, the foreign spirit being, however, coarser, and only used for fortifying wines and for methylated spirit for manufacturing purposes. According to the statistics for 1871, there was distilled in Scotland 13,813,062; in Ireland, 9,302,253; and in England, 7,739,720 gallons. In 1875-76, duty was paid in England on 13,668,944 gallons; in Scotland on 9,171,002; and in Ireland on 8,379,096. The largest quantity is always made in Scotland; but owing to a large quantity of the spirit being removed to England duty free, to be converted by English rectifiers into British gin, duty is paid on it in England. Scotland sends to England, in excess of the quantity returned from that country, about 3½ millions, and Ireland sends upward of a million gallons annually. The surplus not accounted for is either exported or retained in bond. Owing to legislation in 1848, the export of British spirits rose from less than 800,000 gallons very rapidly, though with great fluctuations, till in 1856-1857, it reached nearly 6 millions of gallons; but owing to continental competition, our export has fallen below 1½ million gallons annually, and the trade is now almost entirely colonial.

Export is encouraged by a drawback in excess of duty of 2*d.*, while 5*d.* a gallon is added to duty on foreign spirit imported (except rum, on which 2*d.* is charged). This allowance is to equalise the loss caused by excise restrictions to the native producer. The manufacture of whisky (as well as of other spirits) in the United Kingdom is placed under the surveillance of the Excise, and by act of parliament (6 Geo. IV. c. 80) the distiller is subjected to numerous stringent regulations, with a view to prevent the evasion of the very high duties.

Parliament attempted, about the beginning of the 18th c., to check the excessive use of ardent spirits by imposing the enormous duty of 20*s.* a gallon, and taxing retailers. The trade became unprofitable, and got entirely into the hands of the profligate and criminal classes. Smuggling flourished, the excise-officers were violently opposed, and informers hunted down. The act became a dead letter, and was repealed in 1742, and a moderate duty imposed.

In Ireland, the repressive system was carried to a still greater extent, a fine being imposed on the *distiller* in which illicit distillation was detected, and the unfortunate operatives subjected to transportation for seven years. The effect of this was, that of 10,000,000 gallons annually (1820-1822) consumed, only about 2,000,000 paid duty; frequent and murderous conflicts took place between the smugglers and the excise-officers and military, and much of the country was almost in a state of rebellion. In Scotland also, illicit distillation flourished afresh at each rise of the duty; lawless violence was resorted to freely, the common people invariably sympathising with or aiding the smugglers; and in many cases the officers of excise were effectually intimidated. The difficulty of dealing with illicit distillation in Ireland and Scotland led to the adoption, beginning with 1823, of a considerably lower duty in these two countries than in England. The following table exhibits the relative rates of duty on spirits in England, Scotland, and Ireland at different periods during the present century:

	England.	Scotland.*	Ireland.
	s. d.	s. d.	s. d.
1802	5 4½	8 10½	2 10½
1806	8 0	—	8 7
1804	—	5 10	—
1811	10 8	8 0½	2 6½†
1815	—	9 4½	6 1½
1817	—	6 2	5 7½
1819	11 8½	—	—
1822	—	2 4½	2 4½
1826	7 0	2 10	2 10
1830	7 6	3 4	3 4†
1840	7 10	3 8	3 8
1853	—	4 8	3 4
1855	8 0	8 0	6 2
1858	8 0	8 0	8 0

In 1858, the duty on spirits was equalised in the three kingdoms, thus putting a stop to the systematic and (as was found) irrepressible practice of smuggling spirits from Scotland and Ireland into England, which had prevailed for a long time previously. The duty was in 1860 raised to 10*s.* per imperial gallon, at which rate it still remains. This rate was increased to its present value by Mr Gladstone with the avowed intention of diminishing the consumption of ardent spirits; and though it does not seem to have produced this effect, neither has it, as was always the case formerly, increased the practice of illicit distillation, owing to the improved moral tone of the population, the more thorough execution of the law, and the great capital embarked in the distilling trade acting as a deterrent against fraudulent distillation on any extensive scale. Illicit distillation is now very much on the decrease and is almost confined to Ireland. The high price of whisky, besides limiting its consump-

* The duty differed in the Highlands and Lowlands till 1814, the difference varying from 6*d.* to 2*s.* 5*d.*, giving rise to a considerable amount of smuggling.

† For the two years—afterwards doubled.

‡ Reduced to 2*s.* 4*d.* after 1834.

tion, has had a deleterious effect in increasing the temptation to produce a cheaper drink for the poorer classes by introducing noxious materials resembling it in effect and flavor. In years when the vine crop in France is a failure, large quantities of whisky are sent to that country, and returned as French brandy. In the United States, the process of manufacture is the same as in this country, and is largely carried on in New York, Pennsylvania, Ohio, Illinois, Indiana, Kentucky, and, in a less degree, in Tennessee, Missouri, and California. A large quantity is also rectified and reduced to alcohol, and much is exported and in part returned in the form of "French brandy," "Hollands," &c. The "Mouonguhela" whisky of Pennsylvania, and that from Bourbon County, Kentucky, are considered the best in the United States, and always fetch a high price.

WHIST, a game at cards, believed to be of English origin; probably a development of the game of *trump* (or, more properly, *triumph*), which was played in England at least as early as the time of Henry VIII. Trump (or triumph), is mentioned in a sermon delivered by Latimer on the Sunday before Christmas 1529. The game of trump is also mentioned by Shakespeare punning on the word triumph (see Douce's "Illustrations," and "Antony and Cleopatra," act iv. scene 12). The game of whist is not mentioned by Shakespeare, nor by any writer of the Elizabethan era.

The earliest mention of *whist* (or, more properly, *whisk*) is in the poems of Taylor the Water poet (1631). In the first edition of Cotton's "Compliment Gamester" (1674), whist has no place; but it is added in the second edition (1680) as a game "commonly known in England." Cotton says that the game of whist is so called from the silence that is to be observed in the play; and this derivation of the word has been generally accepted, and was adopted by Dr Johnson, to the extent of explaining whist to be a game requiring silence. But if the original name of the game was *whisk*, Cotton's derivation fails. The derivation from an interjection signifying silence seems to have been taken for granted somewhat hastily.

The game was formerly played nine-up. The change to ten-up seems to have taken place in the first quarter of the 18th century. Whist played ten-up is called *long whist*. About 1785, the experiment of dividing the game into half was tried, and *short whist* was the result. The short game soon came into favor; and in 1864 the supremacy of short whist was acknowledged by nearly all the London and by many country clubs, the clubs adopting as their standard the laws of short whist as framed by committees of the Arlington and Portland.

Edmond Hoyle, the first writer of any celebrity on whist (commonly called the father of the game), was born in 1702—it is said in the neighborhood of Halifax, Yorkshire, but on insufficient grounds. He was educated as a barrister. He first published his "Short Treatise" about 1742. He used to give lessons in whist at a guinea a lesson. His "Short Treatise" ran through many editions (16 or more) during his lifetime; and since his death, his words have been reproduced in numberless ways. Hoyle died in Welbeck Street, Cavendish Square, on August 29, 1769, aged 67.

The game of whist is played by four persons, two being partners against the other two. The partners set opposite to each other. The partnership is determined by cutting. The two lowest are partners against the two highest, and the lowest has the deal and the choice of seats and cards. In cutting, the ace is reckoned lowest. Each player has a right to shuffle the pack once before each deal, the dealer having the privilege of a final shuffle. The shuffling being concluded, the player to the dealer's right cuts the pack. The dealer having renounced the packets, is bound to deal the cards one at a time, to the players in rotation, beginning with the player to his left. He turns up the bottom card (called the trump card). The deal being completed, the players sort their cards and the player to the dealer's left (or leader) plays a card face upwards on the table. The other players follow in rotation, being bound to follow suit if they can. When all have played, the trick is complete. It is then gathered and turned over by the winning side. The highest card wins the trick. The ace is highest in playing; and the other cards reckon in the order, king, queen, knave, ten, &c., down to the deuce, or two, which is lowest. If any player cannot follow suit (i. e., has none of the suit led), he may play any card he pleases. If he plays a card of the suit turned up (called trump), he wins the trick, unless another player also, having none of the suit led, plays a higher trump. The player who wins the trick becomes the

leader for the next trick, and so on till the whole hand (consisting of 13 tricks) is played out.

After scoring, the mode of which will be presently described, the player to the last dealer's left deals in his turn; and in subsequent deals, each player deals in turn, the rotation going to the left.

After the hand is played out, the scoring is thus performed: the side who wins more than six tricks reckon one for each trick above six; and the side who either separately or conjointly hold more than two of the following cards, ace, king, queen and knave of trumps (called honors), reckon as follow: If they hold any three honors, they score two (that being the excess of their honors over their opponents'); and similarly, if they hold four honors, they score four. At short whist, players who are at four, cannot score honors. The same at long whist with players who are at nine. The side who thus in one hand or in a succession of hands first reach five at short whist, or ten at long, score the game.

A game at short whist is called a single, if the adversaries have already scored three or four; a double, if they have scored one or two; a treble, if they have scored nothing. A game at long whist is a single, if the opponents have scored five or more; a double, if they have scored less. There is no treble at long whist.

A rubber consists of the best two games out of three. If the same players win two consecutive games, the third is not played. The winners of the rubber win in points the value of the games they have won, and where the rubber has consisted of three games, the value of the loser's game is deducted. And whether two or three games are played, two points are added for the rubber at short whist; one point for the rubber at long. Thus, if at short whist A B (partners) win a single and a double, they win three points on the games, and they add two for the rubber, making five points. Had A B won the same, but C D (their opponents) won a treble, they would have to deduct three points, the value of the opponents' game, and would only win two points. Long whist is now seldom played.

Whist is a mixed game of chance and skill. The chance resides in the holding honors, and the fortune of having high cards dealt in the hand. The skill consists in the application of such knowledge as shall, in the long run, turn the chances of the cards in the player's favor. At the commencement of the hand, the first lead presents a problem of almost pure chance; but as the hand proceeds, observation of the fall of the cards, inference therefrom, memory and judgment come in, so that towards the end of the hand we are often presented with a problem of almost pure skill. It is this ever-varying gradations of skill and chance that give the game its chief interest as a scientific pastime.

In order to become a skilful player, it is necessary to bear in mind that the game is not one of any given player's hand against the other three, but a combination of two against two. In order that two partners shall play their hands to the best advantage, they must strive, as much as possible, to play the two hands as though they were one. To this end, it is advisable that they should pursue some uniform system of play, in order that each partner shall understand the plans of the other, and so be placed in the most favorable position to assist him in carrying them out. The experience of the last hundred years has developed a system of play tending to this result. Of this we proceed to give an epitome.

The first, or, as it is commonly called, the *original* lead should be from the player's strongest suit. A strong suit is one that contains either a large number of cards (four or more) or several high cards. The suit containing the largest number of cards (numerical strength) is the one to be mostly preferred. The object aimed at in opening with the strongest suit is to exhaust the cards of that suit from the other hands. When this object is accomplished, the cards of the suit which remain in the leader's hand (called long cards) obtain a value which does not intrinsically belong to them. They often become of great service, for when led, they either compel the adversary to trump, or they make tricks. And when trumps are all out, the player who has the lead makes as many tricks as he has long cards.

On the other side, by opening weak suits, there is considerable risk of sacrificing partner's strength, and of leaving long cards with the opponents.

Some players are prone to lead single cards, but experience shews that weak leads, as a rule, do more harm than good. Sometimes a trick or two is made by

playing a trumping game; but the chances are that such tactics sacrifice partner's hand, and clear the suit for the adversaries.

The proper card of the strong suit to lead is, as a rule, the lowest. The intention is for the third player to play his highest, and so to assist in clearing his partner's strong suit. Moreover, if the leader keeps the best cards of his suit in his own hand, he has a fair chance of getting the lead again when his suit is nearly or quite established. But with ace and four or more small ones, it is considered best to begin with the ace, lest the ace is trumped, second round. Also, with a strong sequence in the strong suit, it is best to lead one of the sequence first, let the adversaries win with a very small card. The following are the principal leads from sequences:

From ace, king, queen—lead king, then queen.
 From ace, king, and small—lead king, then ace,
 From ace, queen, knave—lead ace, then queen.
 From king, queen, knave, and more than one small—lead knave
 From king, queen, knave, and one small—lead king.
 From king, queen, and small—lead king.
 From king, knave, ten, nine, &c.—lead nine.
 From king, knave, ten, and small—lead ten.
 From queen, knave, ten, and small—lead queen.
 From knave, ten, nine, and small—lead knave.

After the first trick, the lead may remain with the first leader. His best play, as a rule, is to continue his suit. If the lead falls to another player, his play, as a rule, will be to open his best suit: and so on. If the lead falls to the first player's partner, he has choice of two modes of play. If he has a good strong suit of his own, as, for instance, one of those in the list above, and containing four or more cards, he would, as a rule, open it; if not, he would, as a rule, do well to continue the suit his partner first led; or, as it is commonly called, to return his partner's suit. The object is to strengthen partner by assisting to clear his strong suit.

In returning a suit, if the player has only two cards of it remaining in his hand, he should return the highest; if more than two, the lowest. The exception is, if he has the winning card, he should return that irrespective of the number of other cards in the suit. The reason of this rule is that, with but two cards of the suit remaining, the player is weak in the suit, and he is therefore bound to sacrifice his good card to support his partner. But with three or more remaining after the first round, he is strong, and is therefore justified in calling on partner to support him.

This rule of play is most important. It should be carefully observed with even the smallest cards, as it enables partner to count the situation of the remaining cards. For example: A leads a suit in which C (his partner) holds ace, three, and two. In returning A's suit, after winning with the ace, C is bound to return the three, and not the two. When C's two falls in the third round, A will know that his partner has no more of the suit. But suppose C's cards to be ace, four, three, and two. In returning the suit, C is bound to choose the two. Then after the third round, A will conclude with certainty that C has at least one more card in the suit.

Late in a hand, the considerations with regard to the lead vary. If there is no indication to the contrary, it is best for each side to continue the suits originally opened by them. But the fall of the cards may shew that it is disadvantageous to persevere in the suits first led. In such cases, the player must have recourse to other and weaker suits. The general rules to be observed here are—to choose a suit in which there is reason to infer that the right-hand adversary is weak; or—but this is less favorable—one in which the left-hand adversary is strong. In either case, if the suit chosen contains but three cards, none higher than knave, or only two cards, it is generally right to lead the highest.

The second player, as a rule, should play his lowest card, in order to preserve his strength in the leader's suit. The first trick in the suit is left to partner, who has an even chance of holding a better card than the third player. But if the second hand has a strong sequence, he should play the lowest of the sequence, by which partner's hand may be saved, and a high card still remain over the original leader.

The following are the principal sequences :

With ace, king, queen—play queen.
 With ace, king, &c.—play king.
 With king, queen, knave—play knave.
 With king, queen, &c.—play queen.
 With queen, knave, ten—play ten.
 With queen, knave, and one small—play knave.

When a high card is led, it is sometimes advisable for the second player to cover it with a higher one. The shortest rule is to put an honor on an honor, if with but two or three cards of the suit. With king or queen, and four of the suit, it is better to pass an honor led.

When the second hand has none of the suit led, he should, as a rule, trump, if he has but two or three trumps; but he should not trump a losing card if he has more than three trumps, the reason of which will be explained when treating of the management of trumps.

The third hand, as a rule, plays his highest card in order to support partner in his suit. The exceptions are, with ace, queen, &c., the queen is to be played; and if partner has begun with a high card, it is often right to pass it.

The management of trumps varies according to whether the player is strong or weak in them. If strong (i. e., with four or more), they should not be used for trumping, if it can be avoided, but should be kept together, in hopes of establishing a suit, and of remaining with the long trumps, with which to get the lead after the other trumps are out, and so to bring it in. Thus, if the opponents lead a losing or doubtful card, it is better, as a rule, not to trump it when holding four trumps. But if the opponents lead a winning card, it is, as a rule, better to trump it, though holding four trumps, than to pass it in hopes of bringing in a suit.

With five trumps, the chance of succeeding in exhausting the opponents' hands, and of remaining with the long trump, is so considerable, that a player having five or more trumps, should lead them; and as number is the principal element of strength, he should not be deterred from leading trumps merely because the fourth hand has turned up an honor.

With four trumps only, it is better first to lead the strong suit. When the adversaries' hands are cleared of that suit, or so far cleared that the holder of the long cards in that suit commands it, it is, as a rule, safe to lead from four trumps.

As a rule, less than four trumps should not be led from. But a player is justified in leading from weak trumps, if he holds winning cards in every suit; if the adversaries are both trumping a suit; or if the game is lost, unless partner has strength.

It is most important to return partner's trump lead at once, unless he has led from weakness; for partner, by leading trumps, declares a strong game, and it is then the best policy to abandon one's own plans, and to support his.

It follows that a player should not, as a rule, lead a card for his partner to trump, unless he has four or more trumps; for with less than four trumps, the player is weak; and if he forces his partner to trump, partner is weakened also; and the chances are that by weakening partner under such circumstances, the command of trumps will remain with the adversaries.

But a player may force his partner, although weak himself, if partner has already been forced, and has not afterwards led trumps; if partner has already declared weakness in trumps, as by trumping a doubtful card second hand; if two partners can each trump a different suit; and when one trick from partner's hand wins or saves the game.

The same considerations which make it inexpedient to force partner when weak one's self, shew the advantage of forcing a strong trump-hand of the opponents.

There are yet some general rules of play which have not been explained.

The second, third and fourth players should always play the lowest of a sequence. The rule here given is in conformity with the play that would naturally be adopted in playing cards that are not in sequence; and by keeping to a uniform plan, players are enabled to infer what cards their partner does or does not hold. It is true that the adversaries often gain the same information; but it is found by experience that it is of more advantage to inform partner than to deceive the opponents.

As a rule, it is advisable to lead out the winning cards of partner's suit. The winning cards, the suit is cleared for him and his long cards are not obstructed. The reverse applies to suits led by the adversaries. It is mostly right to retain the winning cards of such suits as long as possible, in order to stop the establishment of them.

When a player has none of the suit led, he should, as a rule, throw away from his weakest suit; for by discarding from a strong suit its numerical power is damaged. But when the adversaries have shown great strength in trumps, it is not advisable to keep small cards of a long suit, as it is not likely that it can ever be brought in. Under such circumstances the player should throw away from his best protected suit, and keep guards to his weaker ones.

Players should watch the cards as they are played, and endeavor to infer from them where the others lie. Thus, if a player wins a queen with an ace, it may be inferred that he has not the king, the rule being to win with the lowest; if a player leads trumps at starting, it may be inferred, as a rule, that he is strong in trumps, or has a very fine hand. By recording in this way, and by counting the number of cards played in each suit, skilled players will often, towards the close of a hand, know the position of all the important cards remaining in; and by means of this knowledge, they will be able to play the end of the hand to the same advantage as though they had seen all the cards.

And lastly, and most important of all, players should play to the score. Thus, wanting but one trick to save or win the game, a winning card should be played at once. The example is stated as for one trick; but it should always be kept in mind how many tricks are requisite to win or save the game, or even a point, and the play should be varied accordingly.

The previous condensed outline embodies the principal rules of play. For more detailed information, the reader is referred to Professor P.'s Essay on the modern scientific game; "Cavendish's Principles of Whist," and "J. C.'s" treatise on the game. They should be read in the order here indicated.

WHISTON, William, was born on 9th December 1667, at Norton, in Leicestershire, of which place his father was rector. His earlier education he received at home; subsequently, he became the pupil of a Mr Antrobus at Tamworth, and finally he went to Cambridge, where he greatly distinguished himself, chiefly as a student of mathematics. In 1690, he took his degree, and obtained a Fellowship in 1693. The year after, he became chaplain to Dr More, Bishop of Norwich; and in 1698, having been presented to the living of Lowestoft, in Suffolk, he was married to Miss Antrobus, the daughter of his old preceptor, his Fellowship being thus forfeited. Meantime, in 1696, had appeared his "Theory of the Earth," a work which, despite, or perhaps in virtue of, the oddity of certain of its speculations, procured him a considerable reputation. That his genuine claims as a man of science were considerable, is made clear by the fact, that in 1704, by the express influence of Sir Isaac Newton, whose acquaintance he had made some years previously, he was appointed to succeed him in the Lucasian Professorship at Cambridge. On receiving this appointment he gave up his living, and again settled himself at the university. In addition to the duties of his chair, he engaged in clerical work; and such was his success as a preacher, that he would probably have attained high position in the church, had not the development of his theological opinions led him into Arian heresy—his frank and fearless avowal of which at once in his preaching and his writings led, in 1710, to his expulsion from his professorship and the university. In the same year appeared the most noted of his original writings, "An Historical Preface to Primitive Christianity Revived." His subsequent prosecution in the church courts forms a curiously complicated chapter in the history of such matters. The result was, that after five years of vexatious suspense, during which the proceedings layed hither and thither in the strangest way, they proved in the end abortive, and W. was permitted to remain formally a member of the Church of England. By many of the clergy, however, much dissatisfaction was expressed; the famous Dr Sacheverel in particular thundered from the pulpit against the delinquent, and refused to admit him to communion—an example which was followed by others. It seems significant of the social stigma attached to him in the minds of the orthodox, that when Halley, in 1720, proposed him as a member of the Royal Society, his old friend Newton successfully opposed his admission. W. himself, the most amusingly

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presumption is that he has led from his strong suit; and by leading out the vain of men, remained indeed deeply convinced that Newton's conduct was dictated by jealousy of his superior scientific genius—a notion in which he probably found not many to agree with him. Having no ostensible means of livelihood, W. was frequently reduced to great straits; but he had kind friends, who were ready to assist him at need. In the dissemination of his religious opinions he continued unwearied; his publications on the subject were numerous; also, he occasionally delivered lectures; and he instituted a religious society, which had meetings at his own house. He also busied himself much with scientific crotchets, chief among which was a scheme for calculating the longitude, of the success of which he was assured. He died on the 22d of August, 1752, at the great age of 85. Of all his numerous works, a translation of Josephus was the only one which continued for a time to perpetuate the name of its author; and of this there have been several reprints. His *Memoir of his own Life* (published in his lifetime in 3 vols. 1749–1750) is a curious specimen of self-portraiture, and conveys a very vivid image of this strange, whimsical, eccentric, but thoroughly honest and conscientious man.

WHITBY, a parliamentary borough, market town, and thriving seaport in the North Riding of Yorkshire, on both sides of the mouth of the Esk, about 50 miles north-north-east of the city of York by railway, and 42 in a straight line. A stone bridge with a swivel, by which vessels are admitted into the inner harbor, connects the two parts of the town. Two piers, of which the west one is about 1000 feet long, run out into the German Ocean, and protect the outer harbor, and it is further protected by two inner piers, which break the force of the waves during storms. On a cliff about 350 feet high stands the Parish Church, which is approached from the town below by a flight of nearly 200 steps. There are dry docks for the building and repair of ships; iron and jet ornaments are extensively manufactured—the jet found in the vicinity having a world celebrity. Alum and ironstone—the latter found in great quantities—are exported. Of late, W. has risen into importance as a watering-place. In 1872, 898 vessels of 22,329 tons entered, and 23 of 1277 tons cleared the port. Pop. (1871) 13,094.

The Saxon name of the place was *Streoneshalch*, but when the Danes took possession of it they called it *Whitby* (white town,) just as they changed the Saxon *Northweorthing* into *Deornby* or *Derby*. The termination *by*, which is characteristic of Danish settlements, is a corruption of the old Norse *byr*, modern Icelandic, *boer*, a dwelling, farmstead, town. In Devon the suffix occurs in the form *bere* or *beer*, as in *Rockbere*, *Larkbere*.

WHITCHURCH, a small market-town of Shropshire, on a height, 20 miles north-north-east of Shrewsbury by railway. Trade in malt, hops, and shoes is carried on. Pop. (1871) 3694.

WHITE, Gilbert, author of the "*Natural History and Antiquities of Selborne*," was born at Selborne, in Hampshire, on July 18, 1720. Educated at Oriel College, Oxford, he received his M.A. degree in 1746, and in 1752 he was made a senior proctor of the university. At an early period of his life he retired to his native village, to indulge his taste for literature and natural history; and there he died on June 30, 1793. His charming "*Natural History and Antiquities of Selborne*," which has made W. an indisputable English classic, was published in 1759. Probably no book on natural history has been more frequently reprinted. Among the various editions may be mentioned that of E. T. Bennet, and the one by Frank Buckland, with a chapter on antiquities by Lord Selborne (1875). After W.'s death, Dr Alkin published a selection from his natural history journal, under the title, "*A Naturalist's Calendar*."

WHITE, Henry Kirke, was born on the 21st March 1735, at Nottingham, in which place his father was a butcher. At the age of 16 he was apprenticed to an attorney; and, while in his business he shewed exemplary diligence, his leisure-hours were passionately devoted to intellectual pursuits, and especially to the cultivation of poetry. He also became a member of a literary society in Nottingham, and began to attract notice by his fluency and ability as a speaker. To the "*Monthly Mirror*" he was wont to send contributions, and the merit of his verses drew to him the attention of Mr Hill, its proprietor. Acting on the advice of this gentleman, and Mr Capel Loft, who also took a generous interest in him, he published

in 1804 a small volume of poems, which was cruelly treated by the critics, and found little acceptance with the public. It was the means, however, of securing him influential friends, notably Southey and the Rev. Mr. Simeon, through whose influence a sizarship in St John's College, Cambridge, was procured for him. In his studies he highly distinguished himself; but the ardor with which they were pursued speedily proved the ruin of a constitution at all times delicate; consumption rapidly developed itself, and he died October 19, 1806. The year after two volumes of his "Remains" were published by his friend Southey, to whom his MSS. had been intrusted, prefaced by a pleasing Memoir of the deceased poet. W.'s poetry, however, is now almost forgotten.

WHITE, Rev. Joseph Blanco, was born at Seville, in Spain, on 11th July, 1775. His father was a merchant there of Irish parentage, who had married a Spanish lady of old Andalusian family. Finding his father's counting-house on trial not at all to his mind, he quitted it to prepare himself for holy orders, and in 1799 he was ordained a priest. But born with a mind curiously restless and inquisitive, he ceased in no long time to find himself at home in the Romish communion; and in 1810 he came to England, which he never afterwards quitted. Joining himself to the English Church, he seems to have meditated becoming one of its clergymen; an intention which it is quite as well he did not carry out, inasmuch as his speculations rapidly led him to results not recognised by English orthodoxy. On coming to England, he settled himself in London, where for some years he conducted a monthly Spanish paper called "El Español." On the cessation of the Peninsular War in 1814, this publication ceased also, as having no longer a *raison d'être*; but meantime its services to the government of the day had been such as to secure for its editor a pension for life of £250 per annum. Subsequently, W. lived chiefly in London, employed as a man of letters. Though in literary circles recognised as a man of fine talent, and known as a contributor to the "Quarterly" and "Westminster Reviews," and other high-class periodicals, he scarcely succeeded in making a permanent impression on the public by any of his more formal publications. Of these, the most important were: "Letters from Spain" (1823), contributed some years before to the "New Monthly Magazine;" "Practical and Internal Evidence against Catholicism" (1835); "Poor Man's Preservation against Popery" (1825); and "Second Travels of an Irish Gentleman in Search of a Religion" (2 vols. 1833). He died on the 20th May 1841, in Liverpool, whither he had removed some years before. In 1845 there was given to the world, as his legacy to it, by much his most striking and valuable work, "The Life of the Rev. Joseph Blanco White, written by himself; with portions of his Correspondence;" edited by John Hamilton Thom (London, 3 vols. 8vo). This book, at the time of its appearance, excited a good deal of interest, and is still eminently worth referring to. The curious picture it presents of a mind at once pious and sceptical, longing and sorrowing after a truth which it can nowhere find, or finding, contrive to rest in, has, in the present unsettled state of religious opinion, a very particular significance. Poor W.'s long-life "search for a religion" seems not to have been a successful one, and to have landed him at the last in a condition of nearly entire scepticism.

WHITEBAIT, a small fish, called by Valenciennes *Rogentia alba*, and for which he constituted the genus *Rogentia* as a distinct genus of the Herring family (*Clupeidae*), but which is now generally regarded by naturalists as merely the fry of the herring. The W. fishery is actively prosecuted on some parts of the British coast, particularly in the estuary of the Thames, where the W. is very abundant in spring and summer, beginning to appear in the end of March or early in April. Adult W. are caught on the coasts of Kent and Essex during winter, and in this condition are about six inches in length. W. is also found in the Forth. It is much in request as a delicacy for the table, forming a favorite dish of epicurists. At the time when ordinarily captured, W. are only from an inch and a half to four inches in length. They are caught by means of bag nets sunk four or five feet below the surface of the water. For several months they continue to ascend the river in shoals with the flood-tide, and descend with the ebb-tide, not being able to live in fresh water. They are fried with flour or crumbs; they are often laid on a napkin and sprinkled with fine flour and a little salt, rolled about till well covered with flour, and then thrown into a pot of boiling lard, where they remain till they are of a pale straw color.

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Londoners resort to Greenwich and Blackwall to enjoy W. dinners. It has become the practice of her Majesty's ministers to repair to Greenwich for a W. dinner every year before the prorogation of parliament in autumn. Some of the corporations of London indulge in a similar annual festivity. The W. has the body more compressed than the mature herring; the belly is serrated; the lower jaw is longer than the upper; the scales are very soft, small and thin, and very easily rubbed off; the color is silvery white, greenish on the back. The food of the W. seems to consist of minute crustaceans. It seems probable that the fry of all the British *Clupeidae*—the pilchard, the sprat, and the shad—are indiscriminately taken and used like the fry of the herring, under the name of whitebait.

WHITEBOY, the name of an illegal association of the peasantry in Ireland, which for a long series of years was the fruitful source of agrarian outrage, sometimes of a very revolting and sanguinary character. The association had its origin in the early years of the reign of George III.; and first took an organised form in the county of Tipperary, where it appeared in the shape of a united resistance to an attempt on the part of certain proprietors to enclose and appropriate lands up to that time common. The movement at the beginning was confined to throwing down the newly erected fences, and destroying the enclosure, from which circumstance the rioters were in the first instance called "Levellers;" but their views soon extended further, and they addressed themselves to the redress first, of the oppressive exactions of tithes, and afterwards of various other grievances, especially those connected with the tenure of land. The name of Whiteboys was given to them in consequence of their wearing white shirts in their nightly expeditions. Many acts of cruelty and outrage having been committed, a special commission was issued in 1762 for the trial of the offenders; but the repression was only partial and temporary, and Whiteboyism reappeared more than once in the southern province. In 1787, a new association, the members of which called themselves "Right-boys," appeared in the same district, and was made the subject of discussion in the Irish parliament. The conflicts of the northern Orangemen (q. v.) and Ribbonmen (q. v.) for a time drew attention away from the minor discontents of the south; but the same spirit of secret combination has continued among the peasantry down to the present day. The Shanavests, Caravats, Rockites, Terry Alfs, and other more obscure or more local denominations, must be regarded as embodiments of the very same discontent, which has long held its ground among the poorer classes in Ireland, and which, although undoubtedly exaggerated and embittered by the recollections of hereditary wrong inseparable from the condition of a conquered people, are held, even by politicians of moderate views, to have much justification in the social condition of the people, and in certain striking anomalies of the legislature in reference to Ireland. The ground of discontent furnished by the endowment and establishment of the church of a small minority of the population, has now ceased to exist. See **FENIAN SOCIETY**.

WHITE COLORS. The principal white pigments used by painters are: (1) *White Lead* (see **LEAD**), which is not only used as a color, but forms the body of most oil-paints; (2) *Derbyshire White*, which is sulphate of baryta; (3) *Pearl White*, or trimellite of bismuth; and (4) *Zinc White*, or hydrated oxide of zinc.

WHITEFIELD, George, one of the founders of Methodism, was born in the Bull Inn, at Gloucester, on the 16th December 1714. He was educated at the grammar-school of his native town, at which he appears to have distinguished himself, especially by eloquentary displays at the annual visitations. On leaving school, he was for a time engaged assisting in the business of his mother, the hostess of the Bull Inn; but he obtained admission as a servitor at Pembroke College, Oxford, when in his 18th year. About three years earlier, John and Charles Wesley had laid, in the university of Oxford, the foundations of Methodism—a system which, at first, resembled the rule of a religious order more than the bond of a religious sect; requiring from its professors ascetic observances and devotion to works of piety and charity. It was not till he had been upwards of a year at the university that W. became associated with the Methodists. He at once made himself remarkable among them for zeal, for the austerity of his asceticism, for labor too great for his strength among the sick and the prisoners in the jail. His health gave way, and he had to go home, when his native air soon restored him; after which he carried on at Gloucester

the same pious and self-denying practices which he had begun at the university. His conduct drew upon him the attention of the bishop of the diocese, who offered, though W. was only twenty-one, to admit him immediately into orders. The offer was accepted, and W. was ordained a deacon in 1786, before he had taken his degree. He preached his first sermon in Gloucester Cathedral, and the effect of it was remarkable. The vehemence and earnestness of his oratory deeply moved the audience; and five persons are said to have been driven mad with fear and excitement. Complaints were made to the bishop; but this good man gave no heed to them—simply saying that he hoped the madness would last to the following Sunday. During the next two years, W. preached with similar results in various churches in England.

Meanwhile, Wesley had been in America establishing missions among the colonists; and in 1788 he desired W. to join him, a request that was immediately complied with. W. had to go to London to make arrangements for his journey; and this visit, though not his first, seems first to have made him known to the inhabitants of the metropolis, upon all classes of whom—fine gentlemen like Chesterfield, and cool sceptics like Bolingbroke, as well as the more mobile crowd—he afterwards made an impression such as, probably, no other preacher ever produced. His success in London was immediate, and much exceeded all that had befallen him previously. The doors of the church in which he was to preach were besieged before the dawn; the unlighted streets in the early morning were filled with persons carrying lanterns, making their way to the place of worship many hours before the time of service. This lasted until his departure for America. He was hereafter to be almost as closely connected with evangelical labors in America as in England itself; but on this first occasion, his stay was short—only a few months. He returned to be admitted to priest's orders, and to collect funds for the establishment of an orphanage in Georgia. He soon went back to America, but not before a beginning had been made of his split with the English Church, whose clergy he offended by preaching in the open air, whether he got permission from the parish clergyman or not, and by deviating, whenever he thought fit, from the liturgy of the church. But the remarkable and beneficial effects of his preaching on the rude miners and others who flocked to hear him, consoled him for clerical censures; and after this, he seems to have preached almost by preference in the open air. His second visit to America occupied nearly two years. He came back in 1791.

It was about this time that doctrinal differences led to his separation from John Wesley—both of them being by this time disowned by the Established Church. Wesley believed and preached the doctrine of universal redemption; W. was a rigid Calvinist. Each thought his belief of the utmost importance, and in the end, each excommunicated the other. W.'s supporters now built him a large shed at Moorfields, near Wesley's chapel—which, being temporary, was known as the Tabernacle; and his preaching gathered immense audiences around him. But he had no talent for organisation; and as soon as he went away on his frequent and protracted journeys, his supporters began to disperse. But that the Countess of Huntingdon, a lady of wealth and of abilities, became a convert to his views, W., in all probability, would not have founded a sect. But this lady appointed him her chaplain; she built and endowed chapels to maintain his Calvinistic doctrines; and thus a slight memorial of W.'s preaching, though it more directly commemorated the zeal and energy of Lady Huntingdon, remains in what is known as the Huntingdon connection.

One of his most famous missionary journeys was that which he made to Scotland in 1791. He went to Scotland on the invitation of Ralph and Ebenezer Erskine, well known as leaders of a secession from the Church of Scotland; but his notions were too catholic for his friend; he was as ready to preach in a parish church as to a seceding congregation, and more ready still to preach in the open air; and the Erskines soon differed from and separated from him. That the impression he made upon the people of Scotland was very strong and very general, may be inferred from the fact that the leading corporations of Scotland—Edinburgh, Glasgow, Aberdeen, Stirling—admitted him to their citizenship. At Cambuslang, in Lanarkshire—a mining district, mainly inhabited by rude colliers, then *adscripti glebe*—his preaching produced one of the most remarkable "revivals" of modern times; many thousands were stricken with concern about their souls, and violent physical manifestations followed upon their excitement—foaming at the mouth, bleeding at the nose, con-

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vulsions—which, by many who read of them, were attributed to Divine influence, by return to the devil. It was on his return from this visit to Scotland, that W., making a stay in Wales, met and married a widow, a Mrs James. His marriage, like that of Wesley, was not a happy one; and it is recorded that the death of his wife, when it occurred, "set his mind much at liberty."

To America, W. paid seven visits, several of which lasted for two or three years. He set out for America for the last time in 1769. He was ailing at the beginning of the voyage; he was ill at the end of it; and he died somewhat suddenly not long after his arrival in America, at Newberry, near Boston, on the 20th September 1770. A collection of his sermons, letters, and controversial writings was published in the following year ("The Works of the Rev. George Whitefield," 6 vols. London, 1771); and in 1773 were published his memoirs, by Dr Gillespie. His writings do not sustain the impression which would be derived from the accounts of his preaching. They shew him as a man of somewhat slender talent and commonplace quality of mind; quite unlearned; entirely free from the casuistical turn, as well as deficient in the worldly knowledge and prudence, for which Wesley, like many other enthusiasts, was pre-eminent. His success as a preacher seems to have been in no smaller degree due to a sonorous but expressive voice; no doubt it was mainly due to the earnestness of his faith, to the fluency and rude strength of his homely language, and to that vehemence and impetuosity of nature which, perhaps, is the thing most distinctive of the orator. Of the "Memoirs of the Life and Character of George Whitefield," by J. Gillespie, D.D., of the College Church, Glasgow, originally published at London in 1773, subsequent editions, containing additional matter, appeared in 1798, in 1811, 1813, 1818, and in 1827. An anonymous "Life of George Whitefield," founded upon his journals and letters, and borrowing largely from the work of Dr Gillespie, appeared at Edinburgh in 1826. "Whitefield's Life and Times," by Robert Philip, D.D., was published at London in 1837; and there has since appeared a full memoir, under the title "George Whitefield: a Light rising in Obscurity," by Andrews (Lond. 1864).

WHITEFISH (*Coregonus albus*, see **COREGONUS**), a fish of the family *Salmonidae*, of the same genus with the Gwyniad, Vendace, Powan, Pollan, &c. It is found in the lakes and large rivers of North America, from the St Lawrence and its tributaries to the Arctic regions, and is one of the most valuable of American freshwater fishes, abounding over a great extent of country, and being excellent for the table. It is the *Attikaumeg* of the north-western Indians. The body is elongated but thick, the head small and the muzzle pointed, the tail forked, the scales large. The mouth is destitute of teeth. It sometimes attains a length of two feet and a half, and weighs ten pounds. It is bluish-gray on the back, lighter on the sides, and white below. It spawns in October, proceeding from the lakes up the rivers for this purpose. It usually swims in shoals like its small British congeners. It feeds chiefly on insects and entomostraca. It is caught by nets, which are often spread under the ice, and the fishery is attended with much labor and exposure. The Indians sometimes spear it through holes in the ice. The W. forms the principal food of many Indian tribes, and of the fur-traders, during great part of the year. It is often salted by them. The flesh is bluish-white, changing to a pure white when boiled, whence the name. The most southerly lake in which the W. is found is Lake Champlain. No freshwater fish better deserves to be made the subject of piscicultural experiments than the W., and its acclimatization in Britain would probably be as easy as it is desirable.—An allied species, the **OTSEGO W.** (*C. Otsego*), found in Lake Otsego, is also of exquisite flavor; but it is now rare.

WHITE FLUX. See **FLUX**.

WHITE GUNPOWDER is a mixture that was at one time employed in blasting, but is now scarcely ever employed in consequence of the danger attending its preparation, and the facility with which it explodes by friction. Its ingredients are chloride of potash, dried ferrocyanide of potassium, and sugar.

WHITEHALL. a village of New York, U.S., at the head or southern extremity of Lake Champlain and termination of the Troy and Champlain Canal, with important railway and steamboat connections, and water-power for saw and flouring

mills, machine woollen and carpet factories. It was settled by Major Philip Skene in 1761, and was called Skenesborough; in the war of 1812 it was an important military depot. Pop. in 1870, 4322; in 1880, 4270.

WHITEHAVEN, a parliamentary borough and seaport of Cumberland, near the point where the estuary of the Solway Firth joins the Irish sea, 40 miles south-west of Carlisle by railway, 36 in a straight line, and 84 miles east-north-east of Ayre Point, the northern promontory of the Isle of Man. It contains a market-house, custom-house, baths, and a theatre, as well as the West Cumberland Infirmary. The harbor is commodious, but is now dry at low water. The sources of the prosperity of the town are its vicinity to extensive collieries—some of which extend beneath the town and stretch out under the sea—and the extraordinary abundance and richness of the hematite iron ore found in the neighborhood. Coal and iron mines are numerous, there are iron-smelting works, and iron and brass foundries—the manufactured iron being shipped mostly to the Welsh and Irish markets. There are dry docks for the building and repair of vessels; and rope-making and the manufacture of thread and sail-cloth are important branches of trade. W. returns one member to the House of Commons. In 1877, 688 vessels, of 87,514 tons, entered, and 1780, of 217,774 tons, cleared the port. Pop. (1871) 18,451.

WHITE LADY, a being who, according to popular legend, appears in many of the castles of German princes and nobles, by night as well as by day, when any important event, whether joyful or sad, but particularly when the death of any member of the family is imminent. She is regarded as the ancestress of the race, shows herself always in snow-white garments, carries a bunch of keys at her side, and sometimes rocks and watches over the children at night when their nurses sleep. The earliest instance of this apparition spoken of was in the 16th c., and is famous under the name of Bertha of Rosenberg (in Bohemia). The W. L. of other princely castles was identified with Bertha, and the identity was accounted for by the intermarriages of other princely houses with members of the house of Rosenberg, in whose train the W. L. passed into their castles. In the castle of Berlin she is said to have been seen in 1628, and again in 1840 and 1850. The most celebrated in Britain is the W. L. of Avenel, the creation of Sir Walter Scott. It was long a common belief in the Highlands that many of the chiefs had some kind spirit to watch over the fortunes of their house. Popular tradition has many well-known legends about white ladies, who generally dwell in forts and mountains as enchanted maidens waiting for deliverance. They delight to appear in warm sunshine to poor shepherds or herd-boys. They are either combing their long hair, or washing themselves, drying wheat, beating flax, or spinning; they also point out treasures and beg for deliverance, offering as reward flowers, corn, or chaff, which gifts turn in the instant into silver and gold. They wear snow-white or half white half black garments, yellow or green shoes, and a bunch of keys at their side. All these and many other traits that appear in individual legends may be traced back to a goddess of German mythology who influences birth and death, and presides over the ordering of the household. Still more distinctly the appellation W. L. and the name Bertha point back to the great goddess of nature, who appears under various names, and who, as *Bertha* (i. e. the brilliant, shining, white), held her circuit on Twelfth-night and revealed her power. When the legend goes on to say that the Bohemian Bertha of the 15th c. promised the workmen of Neuhauss a sweet soup on the completion of building the castle, and that this soup, along with carp, is still given in remembrance of it to the poor on Maundy Thursday, we recognise again the festival dishes consecrated to Bertha, such as fish, oatmeal gruel or dumplings, &c., which it is still customary to eat about the time of Twelfth-night and Christmas in most districts of Germany.

WHITE LEAD. See LEAD.

WHITE MOUNTAINS, a mountain-chain of New England, U. S., regarded as an outlier of the Appalachian range, commences at the headwaters of the Aroostook River, in Maine, where its first summit is Mount Katahdin, and extends in a broad plateau, from 1600 to 1800 feet high, west by south nearly across New

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Hampshire, where it has twenty bold peaks, with deep, narrow gorges, wild valleys, beautiful lakes, lofty cascades and torrents, forming the "Switzerland of America," and a favorite resort of summer tourists. Mount Washington, the highest summit in New England, 6285 feet, has a practicable carriage-road and a hotel on its summit; Mount Pleasant, the second of the group, is 4762 feet; the lesser are named Franklin, Monroe, Jefferson, Adams, Madison. In the Franconia group are Lafayette, 5500 feet, and Mooselillock, 4634. These mountains furnish the chief sources of the Connecticut, Merrimack, and Androscoggin rivers. The rocks are ancient metamorphic, with naked granite and gneiss. The Ammonoosuck River falls 5000 feet in 80 miles, the Androscoggin 200 in a mile. Five narrow and precipitous notches seem to have been rent in the mountains, and give passage to as many rivers.

WHITE PRECIPITATE. See MERCURY.

WHITE RIVER, a river of Arkansas and Missouri, U. S., rises in the Ozark Mountains, flows north-east into Missouri, then turning east and south-east into Arkansas, drains the north-eastern portion of the State, and flowing southerly, empties itself into the Mississippi near the mouth of the Arkansas. It is 800 miles long, and navigable 850 miles.

WHITE SEA (Russ. *Bjeloe-More*), an arm or great bay or inlet of the Arctic Ocean, which, between Cape Kanin on the Kaminskaya Peninsula, and Cape Sviatol on the Kola Peninsula, penetrates the Russian government of Archangel southwards to lat. 64° n. At its entrance between Capes Kanin and Sviatol it is 100 miles broad; after penetrating the land 150 miles in a south-easterly direction, it narrows to a width of 85 miles; but after sweeping south for 200 miles, it again considerably widens, forming in the north-west the Gulf of Kandalak, and in the south and south-east the great Gulfs of Onega and Archangel or Dwina. The W. S. covers an area estimated at 47,000 sq. m., and the length of its coast line is over 1000 miles. The coasts in the north and east are mountainous, in other places they are mostly low, and abound in lakes, which communicate with the sea by rivers. The greatest depth of the W. S. is 1183 feet. From the middle of August ice forms on the coasts sometimes to the width of 80 miles, and is not melted till the following July.

WHITE SULPHUR SPRINGS, a watering-place in Virginia, U. S., on Howard's Creek, 205 miles west of Richmond. Pop. (1870) 976. It has hotel accommodation for 1500 guests. The spring is in the lowest part of a beautiful valley, and is covered by a dome supported by 12 Ionic columns, and surmounted by a statue of Hygeia: it is 2000 feet above tide-water; yields 80 gallons per minute of water at 62° Fahr., impregnated with sulphates of lime, soda, magnesia, carbonate of lime, chlorides of calcium and sodium, iron, iodine, sulphur, carbonic acid, sulphuretted hydrogen, oxygen, nitrogen. It is considered efficacious in dyspepsia, liver diseases, gout, rheumatism, and diseases of the skin and kidneys. The Red, Salt, and Blue Sulphur Springs, at a distance of 23 to 24 miles from the above, are also much resorted to.

WHITE SWELLING. See JOINTS, DISEASES OF.

WHITETHROAT (*Curruca cinerea*), a bird of the family *Sylviada*, a summer visitant of Britain: plentiful during summer in the greater part of England and in Ireland, but comparatively rare in Scotland. It is also common during summer in the south and middle of Europe, and is found even in the north. It places its nest in a low bush, or among a tangled mass of brambles and weeds. Its food consists both of insects and berries. Its song is not very sweet, but is delivered with great energy, and it seems to vie with other birds in singing, refusing to be outdone. It is very lively and amusing as a cage-bird, and very easily tamed. The whole length of the W. is 5½ inches. Its plumage is brown, of various shades; the breast and belly brownish-white, tinged with rose-color in the male.—The Lesser W. (*Curruca sylvicola*) is a species of much rarer occurrence in Britain. The Whitethroats belong to the same genus with the Blackcap (q. v.) and the Garden Warbler (*C. hortensis*), which is not uncommon in Britain, and almost rivals the Blackcap in the richness of its notes.

WHITE VITRIOL. See ZINC.

WHITE-WASH, slaked quicklime, reduced to the consistency of milk by means

of water. It is used for coloring warts, and as a disinfectant. If merely for coloring, a little size is added, but not when used for sanitary purposes.

WHITE-WOOD BARK. See **CANELLA**.

WHITGIFT, John, the third Protestant Archbishop of Canterbury, was born at Great Grimsby, in Lincolnshire, according to one account in 1530, according to another in 1538. His father was a merchant, and is said to have belonged to a family long established in Yorkshire. His early years were passed within the Abbey of Wellow, near Grimsby, of which his uncle was the abbot; and from that he went to St Antony's School in London, a religious house then in great reputation. About 1548, he was entered at Queen's College, Cambridge. After a short time, he removed to Pembroke Hall, of which he continued a member till 1555, when he was elected a Fellow of Peterhouse. He took orders in 1560, and as he shewed a remarkable talent for preaching, the Bishop of Ely appointed him his chaplain, and gave him the living of Feversham. In 1563, he was appointed Lady Margaret's Professor of Divinity. In 1567, he became Master of Pembroke Hall; and in the course of the same year, Queen Elizabeth, who admired his preaching, and had made him one of her chaplains, appointed him to the Mastership of Trinity College. About this time, he also obtained the Regius Professorship of Divinity, and took his Doctor's degree. He was appointed Dean of Lincoln in 1571, Bishop of Worcester in 1577, and Archbishop of Canterbury in 1583. He at one time held together—under a dispensation from the archbishop—the Deanery of Lincoln, the Mastership of Trinity, the Regius Professorship of Divinity and the living of Feversham; and the dispensation enabled him to hold, along with these, any other benefice whatever. This cannot have been often paralleled, even in the history of pluralities. Of course, the man so favored had rendered and was rendering considerable services to the church and to the crown.

His first work, on becoming Master of Trinity, was upon a revival of the statutes of the university. He obtained such powers for the heads of houses as enabled them to eject from the Lady Margaret's Professorship the able and energetic Puritan, Cartwright, on the score of his Calvinistic creed. He afterwards, at the request of Archbishop Parker, published an answer to an "Admonition of Parliament" (drawn up by a clergyman named Field), presented to the House of Commons on behalf of the Puritans, in which it was maintained that, in matters of doctrine and discipline, the church should admit nothing as authoritative but what was contained in the Word of God. This work was published in 1572. It has always been held that in it W. vindicated the position of the Anglican Church against the Puritans with no less ability than Bishop Jewell shewed in defending it against the Romanists. He was answered by Cartwright on behalf of the Puritans; he replied, and Cartwright rejoined; and as the works on either side were revised by the most learned and eminent men of the two parties, they give an excellent view of the state of opinions in the Anglican Church at this time. After becoming primate, W. labored assiduously to secure uniformity of discipline in the church. He had the full confidence of Queen Elizabeth, who placed all the church patronage of the crown, including the bishoprics, at his disposal, and he was armed with full powers for carrying out his design. He required the clergy not only to subscribe to the Royal Supremacy, the Liturgy, and the Thirty-nine Articles of the Church, but also to a set of additional articles framed mainly with the view of purging the church of Puritanism. The bishops were required to administer those tests; and the clergymen who refused to accept them were deprived of their livings. This measure was harshly conceived; but W. is said to have been a kindly man, and to have used his authority over the clergy gently, especially in his later years. He was made a Privy Councillor in 1586, and in that capacity drew up a set of statutes for cathedral churches, to make their services conform to the principles of the Reformation. He was offered the chancellorship by Queen Elizabeth, but he declined the office. On the accession of King James, he seems to have been much alarmed for the stability of the system which he had spent his life in rearing; and though the monarch treated him with the utmost observance, anxiety upon this account is said to have hastened his end. He died of paralysis on the 29th February, 1603. He is undoubtedly entitled to rank with the ablest and most distinguished prelates that have adorned the English Church. He founded a magnificent hospital and grammar school at Croydon.

WHITING (*Merlangus*), a genus of fishes of the family *Gadidae*, differing from

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the cod, haddock, and their congeners (*Gadus*, or *Morrhua*) in having no barbule on the lower jaw, and also in their more slender form, which adapts them for pursuing their prey more actively and further from the bottom of the sea. The Common W. (*M. vulgaris*) is abundant on many parts of the British coast, particularly on the western coasts of Britain, and on the coasts of Ireland; on the northern coasts of Scotland it is comparatively rare. It not frequently attains a weight of three or four pounds—although the whittings brought to market are seldom of this size; but a W. has been taken of seven pounds weight. The head and body are compressed; the deepest part is at the vent, which is opposite the middle of the first dorsal fin; the upper jaw extends a little beyond the lower; both jaws have long sharp teeth, and there is a triangular patch of teeth on the palate. The scales are small. There are three dorsal fins, and two anal fins; the tail-fin is even. The color is dusky yellow on the back, the sides paler, the belly silver white; there is a black spot on the upper part of the root of the pectoral fin. The W. is a voracious fish, preying on molluscs, worms, crustaceans, and small fishes. It is caught chiefly by hand-lines and long lines; mussels and pieces of cuttle-fish are very generally used for bait. It is in high esteem for the table, and is regarded as particularly delicate and easy of digestion. The flesh is of a pearly whiteness, whence the English name. It very soon suffers change, however, and is in good condition only a short time after being caught; but great numbers of small whittings are sent to market salted and dried, under various names.—Another species of W., Couch's W. (*M. albus*), is sometimes taken on the British coasts. It is more abundant in the Mediterranean. It is more slender than the Common W., and the under jaw is a little longer than the upper. The Coal-fish (q. v.) and the Pollack (q. v.) also belong to the genus *Merlangus*.

WHITING is an impure carbonate of lime, prepared by grinding and then washing chalk, so as to separate the coarser particles from the finer ones, which are collected in masses and dried. It is extensively used for size-painting, and as an article of household economy, for cleaning plate; and on emergency, may be employed as an antidote (in suspension in milk) in cases of poisoning with oxalic, or one of the mineral acids.

WHITLOW, or PARONYCHIA, is a painful inflammatory affection of the phalanges of the fingers, almost always proceeding to suppuration. There are several varieties of this affection, according to the texture primarily attacked; thus, it may be situated in the skin, the cellular (or connective) tissue beneath the skin or under the nail, the tendons or tendinous sheaths running along the fingers, or the periosteum. If the skin be the seat of inflammation, vesicles appear, which soon discharge pus, after which relief is rapidly afforded. Such cases require little care or attention, and give rise to hardly any constitutional disturbance. If the cellular tissue is the primary seat of inflammation, there is a painful sensation of tenderness and throbbing of the part, and often considerable febrile disturbance, until the pus can be evacuated. Although this form is painful, no serious mischief is to be apprehended. When, however, the tendons and their sheaths, or the periosteum, are affected, a much more serious form of whitlow is developed, which has been already discussed in the article TENDON. In this form, the suppuration may extend up the arm, and occasion destruction of the joints, and even death.

Whitlow may originate either spontaneously, or after an external injury, such as a prick from a needle, thorn, &c. In the treatment of the milder forms, the finger or thumb should be held for half an hour or longer in water as hot as can be borne, after which lunar caustic should be rubbed freely over the painful surface; and if there are any febrile symptoms, the patient may take a powder, consisting of 4 grains of calomel, 3 of James's Powder, and 3 of Dover's Powder, at bedtime, to be followed in the morning by an ordinary black draught. The hot local baths should be carried on till matter shews itself; and as soon as its presence and seat are determined with certainty, an incision should be made to admit of its escape. Even if suppuration has not taken place, a free incision into the inflamed part often gives great relief. There is a very pernicious popular idea that the application of cobble's wax, or some other stimulating substance, will draw the inflammation to the surface, and bring the whitlow "to a head." There is reason to fear that a considerable number of fingers are annually sacrificed to this delusion. As it is not always

easy to state in an early stage how a whitlow may turn out, it is advisable that surgical aid should always be at once obtained.

WHITNEY, Eli, American inventor, was born at Westborough, Massachusetts, December 8, 1765, and was educated at Yale College, where he paid his expenses, partly by school-teaching, partly by mechanical labor. Having graduated in 1792, he went to Georgia as a teacher; but finding a generous patron in the widow of General Greene, of the Revolutionary army, he resided on her estate, and studied law. The cotton culture at this period, especially that of the best kind, the "green seed," was limited by the slow and difficult work of separating the cotton from the seed by hand; but Mrs Greene told her complaining neighbors that she was sure W. could help them out of their trouble, for he could make anything. At their desire, he set to work under great disadvantages, for he had to make his own tools, and even draw his own wire; but the reports of his success prompted some lawless people to break into his workshop, and steal his machine, and get others made before he could secure a patent. He, however, formed a partnership with one Miller in 1793, and went to Connecticut to manufacture cotton gins; but the lawsuits in defence of his rights took all his profits, and 50,000 dollars voted him by the state of South Carolina. Finally, in 1798, he got a government contract for the manufacture of firearms, and was the first to effect the division of labor, by which each part was made separately. He made a fortune by this manufacture, carried out with ingenious machinery at Whitneyville, Connecticut; while he had but barren honor from the gin, one of the most important of the whole series of inventions connected with the cotton manufacture. He died at New Haven, January 8, 1826. See **COTTON**.

WHITSTABLE, a long, straggling, maritime village in Kent, on the south shore of the mouth of the Thames, at the mouth of the Swale, 6 miles north-west of Canterbury, with which it is connected by railway. It is noteworthy chiefly because some of the largest artificial oyster-beds lie off the coast, which are regularly farmed by different companies and proprietors. There are breweries, rope-works, copper-works, and boat-building-yards. Some Roman pottery has been found among the oyster beds, indicating that probably a Roman station existed here. Pop. (1871) 5481.

WHITSUNDAY, in Scotland, is one of the usual terms for regulating the letting of houses and farms. It was formerly movable, but was fixed by stat. 1690, c. 59, to mean the 15th May. In many respects, however, local usage overrules the statute; thus, in Edinburgh, the term of entry to a house is the 25th of May.

WHITSUNTIDE ("White-Sunday-tide"), the English name of the season of Pentecost (q. v.), is so called from the white garments anciently worn by the newly-baptised catechumens, to whom that sacrament was usually administered on the vigil of Pentecost. The name "Whitsuntide" comprehends the entire octave or the week which follows Pentecost Sunday; but the word is more strictly applied to the Sunday, Monday, and Tuesday of that week. The two latter days, down to a very recent date, were observed in the Roman Catholic Church as holidays of strict obligation. Many festive observances were anciently practised in connection with the Whitsuntide holidays, which in England and other Protestant countries still subsist, having outlived the religious association out of which they originated.

WHITTIER, John Greenleaf, American author and poet, was born at Haverhill, Massachusetts, December 1807, in the Society of Friends. He worked on a farm and at shoemaking in his boyhood; but at the age of 18, having a strong desire for learning, he studied for two years at a local academy. In 1829, he became editor of the "American Manufacturer," a paper established at Boston to advocate a protective tariff; in 1830, he was editor of the "New England Review," at Hartford, Connecticut, where he wrote a "Life of Brainerd," and "Legends of New England." The subjects of these legends he afterwards worked out in his poems, as "Mogg Megone," "Bridal of Pennacook," "Cassandra Southwick," and "Mary Garvin." Returning to his farm, he was, in 1835, elected to the Massachusetts legislature; in 1836 appointed Secretary of the Anti-slavery Society, and editor of the "Pennsylvania Freeman" in Philadelphia; in 1840 removed to Amesbury, Massachusetts, as

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correspondent of the "National Era." His principal writings are—"Voices of Freedom," poems collected in 1836; "Leaves from Margaret Smith's Journal," poems collected in 1836; "Old Portraits and Modern Sketches," biographical, 1850; "Collected Poems," 1850; "Songs of Labor, and other Poems," 1851; "The Chapel of the Hermita," 1853; "Literary Recreations," 1854; "The Panorama," 1856; "Home Ballads," 1859; "In War Time," 1863; "National Lyrics," 2 vols., 1865—1866; "Snow Bound," and "Maud Miller," 1866; "The Tent on the Beach," 1867; "Among the Hills," 1868; "Ballads of Old England," and "Miriam," 1870; "Child Life," 1871; "The Pennsylvania Pilgrim," 1872; "Mabel Martin," 1874; and "Hazel Blossoms," 1875. These poems have that rugged picturesqueness, and correspondence of sound to sense, which secure wide circulation.

WHITTINGTON, Richard. As the existence of this remarkable man is by many supposed to be wholly mythical, it has been thought not out of place here to state briefly the few authentic facts of his life. W. was descended from a good Gloucestershire family, and was born probably about 1360, the younger son of Sir William Whittington, who possessed the estate of Pauntley in that county. His father died not long after W. was born, and Richard, who had no fortune, set out for London, to endeavor to make one by means of trade. That he left London on account of ill-usage, but was induced to return by his interpretation of the friendly sound of Bow Bells, and that he afterwards made his living through the instrumentality of a cat, are stories not improbable, but which cannot be well authenticated. He appears, however, to have apprenticed himself to a mercer, and to have rapidly risen in the world. It is not known at what date he set up for himself, but we find him a member of the Mercers' Company in 1392, in which year he was elected an alderman of the city, and in the following year was appointed sheriff. In 1398, W. was elected Lord Mayor of London; was again chosen to fill that office in 1406; was elected member of parliament for the city in 1416; and in 1419, for the third time, filled the office of Mayor. These statements accord with the popular story of W.'s having been "thrice Lord Mayor of London," although some antiquaries doubt if he filled that office oftener than twice. W., on account of various services rendered to Henry V., received from that sovereign the honor of knighthood. We are not informed of the date of W.'s marriage; but from various authentic sources we learn that his wife's name was Alice, daughter of Sir Hugh Fitzwarren. She appears to have died several years before her husband, and to have left no issue. W. died in the spring of 1423, aged about 63 years. There can be no doubt that W. was diligent and exceedingly prosperous in business, upright and liberal in character—"a virtuous and godly man, full of good works (and those famous)"—and in many respects considerably in advance of his time. His liberality appears to have been unbounded. At his death, he left the bulk of his property to be laid out in purposes of charity, and in completing those works which had been commenced under his own superintendence. For further details concerning the life of this remarkable man, we refer the reader to the Rev. Samuel Lysons's "Model Merchant of the Middle Ages" (Lond. 1860), an admirable and judicious biography of W.; also to various volumes of "Notes and Queries."

WHITTLESEY, or Whittlesea, a decaying village and market-town in Cambridgeshire, 5 miles east of Peterborough. The population in and about W. are mostly employed in agricultural pursuits and in brickmaking. *Whittlesea-mere*, a shallow lake, which formerly existed in the north of Huntingdonshire, 4 miles south-west of W., was 2 miles in length by one in breadth, and abounded in fish, water-fowl, &c., is now drained and laid out in fenlands, which are under cultivation. W. is connected by a branch with the Great Northern and Great Eastern Railways. The population in 1871 was 4297.

WHORTLEBERRY (*Vaccinium*), a genus of small shrubs, of the natural order *Vacciniaceæ*, having a 4-5-toothed calyx, a 4-5-cleft bell-shaped or urceolate corolla, with the limb bent back, 8 or 10 stamens, with two-horned anthers, and a 4-5-celled many-seeded berry. The species are numerous, mostly natives of the northern parts of the world, with evergreen or deciduous, more or less ovate leaves. —The **COMMON W.** or **BILBERRY (*V. myrtillus*)**, called in Scotland the *Blackberry*, is very common in Britain, and in the middle and north of Europe. It is found also in Iceland and in the northern regions of North America. It delights in

dry situations, but is often found in woods, and often on very elevated mountains. It varies from a few inches to almost two feet in height, and has ovate deciduous leaves, and dark purple berries. A variety occurs, but rarely, with white berries. The berries are very sweet and agreeable, and are much used for making jelly. A kind of spirituous liquor is also made from them in Germany.—The **RED W.**, or **GREAT BILBERRY** (*V. uliginosum*), is common in the northern parts of Britain, and in the north of Europe and Asia. It is said to cover extensive tracts in Greenland. It grows in marshy situation, and is a taller plant than the Common Whortleberry. It has deciduous, obovate, entire leaves, and a fruit larger than the Common W., and inferior to it in flavor. The fruit is said to cause giddiness when eaten in large quantity. An intoxicating liquor is made from it in Sweden and in Siberia. The only other British species is the **RED W.** (*V. vitis idæa*), which is often called **Cranberry**, because of the similarity of its acid fruit to the Cranberry (q. v.). It is a native of the north of Europe, Asia, and America, and is plentiful in some parts of Britain. Its fruit is much esteemed for preserves, and is used in the same way as the cranberry. Large quantities are sent to the south of Europe from the shores of the Gulf of Bothnia. The plant is a pretty dwarf shrub, with obovate evergreen leaves, and racemes of flowers. *V. buxifolium* is generally regarded as a mere American variety of it.—Many species of *Vaccinium* are in occasional cultivation as ornamental shrubs, and the fruit of most of them is agreeable, although in general it wants acidity. Their more general cultivation has perhaps been prevented by the prevalent notion that they require a peat soil, but they succeed on other soils also. Most of them are North American, and the fruit of some of them is often brought to market in North American towns.—The **BLACK W.**, or **HUCKLEBERRY** (*V. angustifolium*, or *Gaylussacia angustifolia*), is a shrub about two feet high, much branched and erect, with deciduous oval leaves. The berries are of a shining black color, and sweet. It is widely diffused from Canada to Georgia. The **BLUE TANGLE-BERRY** (*V. frondosum*, or *Gaylussacia frondosa*) is a rather larger and more spreading shrub, which grows near lakes and springs. The fruit is slightly acid. The **BEAN W.** (*V. vitinum*, or *Gaylussacia vitina*) is found in the mountains of North Carolina; the **BOX-LEAVED W.** (*V. brachycerum*, or *Gaylussacia brachycera*) in Pennsylvania and Virginia. There are other North American species, as *V. Canadense*, *V. humifusum*, and *V. parvifolium*, humble evergreen shrubs. Several species are natives of Mexico. *V. arctostaphylos* is a native of the coast of the Black Sea; and *V. padifolium* is a native of Mount Caucasus and of Madeira, on the loftiest parts of which island it forms impenetrable thickets, growing from six to ten feet high.

WHYDAW, or **Whidaw**, a maritime province of Dahomey (q. v.), on the Bight of Benin. It is populous and very fertile, and exports palm-oil, gold-dust, ivory, and many slaves. The town of W. is the principal seaport of Dahomey, a decaying place, owing to the suppression of the slave-trade. It is still, however, the principal seaport of the kingdom. Pop. formerly 50,000, now under 12,000. It is situated about a mile and a half from the sea, close to a lagoon and a swamp, between which and the sea a sandy neck intervenes. Into the lagoon flow several rivers, known to slave-traders.

WHYDAW BIRD, **Whydaw Finch**, or **Widow Bird** (*Vidua*), a genus of birds of the family of Weaver-birds (q. v.), having long wings, and a boat-shaped tail, the two middle feathers of the tail of the males excessively lengthened during the breeding season. The name is derived from the country of Whydaw in Western Africa, and Widow Bird is a mere corruption of it, which, however, has given to the genus its name *Vidua* (Lat. widow), regarded as appropriate because the long tail of the male drops off after the breeding season, and also because of the general dark color of the plumage. The species are natives of the tropical parts of Africa and the south-east of Asia. They are frequently brought to Britain as cage-birds, both on account of their plumage and the sweetness of their song. The best known species (*V. paradisæa*) is a small bird about the size of a canary, with black and brownish-black plumage, with a broad collar of orange-rufous color, and breast of somewhat similar color; two feathers of the tail in the male very broadly webbed in the breeding season, and ending in a hair-like shaft, two feathers very much elongated, sometimes a foot in length, and about three-quarters of an inch in breadth.

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WICHERN, Joh. Heinrich, superintendent of the *Rauhes Haus* (q. v.), near Hamburg, and known by his exertions in the affairs of the German Home Mission, was born at Hamburg, on the 21st April 1808. He attended the Gymnasium of his native town, and then studied theology at Göttingen and Berlin. Shortly after passing his examinations at Hamburg, he directed himself to practical usefulness, visited the poor and the wretched in the courts and lanes of the town, and undertook the direction of a Free Sunday School for poor children, in which he soon gathered round him from 400 to 500 scholars, instructed by 40 voluntary male and female teachers. At this time W. declined the offer of a charge in the neighborhood of Hamburg, as he already entertained the idea of an institution such as the *Rauhes Haus*, which he opened in 1833. From 1840, W. was much engaged with undertakings of a similar kind in Germany, to which his mother-institution gave rise. The example was soon followed by France on a great scale (Mettray, near Tours), then by England, Holland, and other countries. It was chiefly through the instigation of W., that at the first Protestant Ecclesiastical Assembly held at Wittenberg in 1843, for the purpose of concerting united action, a central Home Mission Committee was appointed, under which title W. had formed the idea of comprehending all exertions on behalf of the poor, the miserable, and the morally and religiously lost. This Home Mission has exerted a wide and beneficial influence on the north of Germany; and as a member of the committee, W. found in it an extended field for his exertions. Travelling through all parts of Germany, W. was the means, by his exhortations, of founding all sorts of institutions and societies for education and the care of the sick, of the poor, and of prisoners. On his return from a visit to England in 1851, the Prussian government commissioned him to inspect all the houses of correction and prisons, to the general supervision of which he was appointed in 1853. Prevented by this constant practical usefulness, he has published but little. In his "*Home Mission of the German Evangelical Church*" (Hamburg, 1849), he explains his views of Christian charity, and its relation to the ecclesiastical and social questions of the day. Since 1844, he has published his "*Fliegende Blätter*" (*Fugitive Leaves*), which contain parts of his discourses at the ecclesiastical diets. In 1851, W. received from the university of Halle the degree of D.D.

WICK, a royal, parliamentary, and municipal burgh and seaport, capital of Caithness-shire, stands on both sides of Wick Water, at the mouth of that stream, and at the head of an inlet called Wick Bay, 16 miles south-south-west of Duncaulby Head, and 20 miles east-south-east of Thurso. The parliamentary boundaries include the royal burgh, containing (1871) 1767 inhabitants, which, with the suburbs of Lousburgh and Boathaven, containing 1000 more, lies on the north side of the river and bay, and Pulteney-town on the south side, pop. over 5000—the total pop. of the parliamentary burgh being, in 1871, 8145. Pulteney-town, a settlement of the British Fisheries Society, is a flourishing town, managed by Improvement Commissioners. The bay is about a mile long by half a mile broad, exposed to frequent storms from east and north-east. There is an excellent tidal harbor of considerable capacity, the property of the said society. The society some years ago undertook the construction of a breakwater in deep water, and spent large sums upon it. Considerable progress was made with the work; but a series of storms destroyed the greater part of it, and the completion of it seems now to be abandoned. The institutions within the parliamentary burgh comprise a county court-house and prison, nine churches and chapels, a town-hall, the Pulteney-town Academy, and a chamber of commerce. There are two weekly newspapers. W. is the great centre of the herring-fishing in Scotland, though of late years the take has not been so great as it had formerly been. Everything in the town is subservient to the herring-fishery; and the trades—chiefly barrel-making, boat-building, and rope-making—are directly supported by it. A railway connecting W. with the south was opened in 1874. In 1876, the number of herring-boats was 867; and 77,408 barrels of herrings were cured. In 1877, 920 vessels, of 93,413 tons, entered, and 904, of 88,190 tons, cleared the port.

WICK, the material used for the centre of candles and lamps, which, from its porous nature, draws up the oil by capillary attraction in such quantities as to burn easily. Usually, wicks are made of cotton, but formerly flax, hemp, and rushes were used. For ordinary candles, the wick consists of a bundle of cotton

thread, lying parallel with each other; but for wax, spermaceti, paraffin, stearin, &c., they are usually of twisted or plaited cotton. Very ingenious contrivances have been applied to the manufacture of candle-wicks, to prevent the necessity of snuffing. See CANDLE.

WICKLOW, a maritime county of the province of Leinster, Ireland, is bounded on the n. by the county of Dublin, e. by the Irish Channel, s. by the county of Wexford, and w. and s.-w. by the county of Carlow and Kildare. Its greatest length is 40 miles, and greatest breadth 33; the total area being 781 sq. m., or 500,173 acres, of which 118,000 are under tillage, 249,300 pasture, 19,500 in plantations, 112,800 towns, waste, &c., and 1090 under water. The pop. in 1851 was 92,978; and in 1871, 78,697, of whom 63,392 were Roman Catholics, 13,968 Protestant Episcopalians, and the rest Protestants of other denominations. The coast-line stretches in a southerly direction about 89 m., is in many parts precipitous, and being, moreover, obstructed by sand-banks, is very dangerous for shipping. The surface ascends in some parts most abruptly from the sea, and a large portion is mountainous and unproductive. The Wicklow Mountains, however, form rather a group than a range, and on the western and north-western side, decline less precipitously towards the central plain. The most elevated point is Lugnaquilla, which is 8039 feet above the level of the sea. Several other peaks approach this elevation, and the glens which lie between the several mountains or groups are exceedingly picturesque, especially Glendalough, Glendalure, Imall, the Glen of the Downs, and Avoca, the scene of Moore's well-known Irish melody, "The Meeting of the Waters." The valleys are, for the most part, of limited extent; but some plains of considerable size lie upon the eastern and southern shore. The lakes, although strikingly beautiful, are few in number, and of small size; and the rivers, some of which drain the eastern, and others the western slope, are little more than mountain streams, at least so far as their course lies within the limits of this county. The Liffey and Slaney rise in W., but do not reach any considerable volume until after they have issued from it. The great central group of mountains is a mass of granite, which protrudes through mica and clay slate, to which latter formation the minor elevations both on the eastern and the western side generally belong. The granitic protrusion, which is one of the most remarkable and best defined in the kingdom, falls away on the east side towards the sea, and on the west, towards the great central limestone. The minerals of W. are numerous and varied in character. In the granite and mica-slate are found galena, green and white lead ore, and copper pyrites. From the clay-slate tract are obtained gold, silver, copper, iron, lead, zinc, tin, tungsten, manganese, arsenic, and antimony. The quantity of gold found is very small. Silver is found in combination with lead, which is raised with great success and profit at Glendalure. The copper mines also are very productive; and of late years, the utilisation of the sulphur, which was formerly wasted, has added largely to the profit of the mining operations.

The climate resembles that of Wexford (q. v.). The soil is very various in character. In the mountains, it is thin and poor, but generally dry, although there is a considerable proportion of bog. In the valleys and level districts, the subsoil is generally gravel, and the soil is, for the most part, either dry, or, even in the boggy districts, susceptible of drainage. On the whole, in the lowlands, the soil is moderately fertile; but there is little cultivation of wheat, the chief agricultural pursuits being dairy-farming and grazing; and the culture, on a limited scale, of barley, oats, turnips, and potatoes. In 1875, the acreage under crops was 112,436, of which more than one-half—viz. 60,883—was under meadow and clover; 25,535 under oats; 11,854 under potatoes; 4453 under wheat; 5678 turnips; 1411 barley; and the rest under the minor crops in small proportions. Flax culture still remains entirely blank, and in the year 1875 was not represented by a solitary acre. In 1876, the number of cattle was 82,390; sheep (of which a small breed prevails in this county), 217,104; horses, 11,519; and pigs, 22,137. The total annual value of property in W., under the Valuation Act, was £272,890 in 1874. There is a large number of villas, with extensive and highly cultivated parks, especially in the picturesque district which lies between Bray and Wicklow. The county is divided into eight baronies. The principal towns are Wicklow (q. v.), the capital, Arklow, Ballyglass, Shillelagh, Rathdrum, Bray, and Newtown-Mount-Kennedy. W. returns two members to the imperial parliament.

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The schools, in 1873, numbered 57, with 12,216 pupils. W. is described by Ptolemy as the territory of the Cancl, and the names of the rivers mentioned by him are still traceable in their modern appellations. At the invasion, the greater part of the lands of W. were granted to Maurice Fitzgerald, and W. was included by John in the shire of Dublin. Generally speaking, however, the authority of the English in W. was little more than nominal; the territory being under the command of the chief of the O'Bryne. A vigorous effort was made by the Lord-deputy, Sir Arthur Chichester, to establish the king's authority in W., and in 1605 it was erected into a separate county; but again, in 1641, the population joined in the general uprising. From the date of the settlement, however, they were effectually held in subjection. During the rebellion of 1798, W. was the scene of more than one conflict, and the peasantry, in some districts, suffered severely from the vindictive character of the repressive measures adopted by the ascendant party.

W. abounds with antiquities of the highest interest. Many tumuli, raths, cromlechs, and other Celtic remains are preserved; and there are very many ecclesiastical remains of almost every period of Irish Christian architecture; those of Glendalough, which include a round tower, are especially interesting.

WICKLOW, a seaport, capital of the above county, is situated at the mouth of the river Vartry, *n. lat.* 52° 58', *w. long.* 6° 2', 32 miles south-south-east from Dublin, with which city it is connected by the Wicklow, Wexford, and Waterford Railway. The pop. in 1871 was 8164, of whom 2483 were Catholics, 618 Protestant Episcopalians, and the rest of other denominations. It is an assize town, the smallest in Ireland. The municipality is administered by 21 town commissioners; but although it is a seaport the export trade is extremely small; nor are the fisheries of much value. The principal exports are the products of the milking operations and the agricultural produce of the district. The streets are narrow and ill built, nor is there any public building deserving of notice.

WICLIFFE, John de, the greatest of all the "Reformers before the Reformation," was born in 1324, and is supposed to have been a native of the parish of the same name, near the town of Richmond in Yorkshire. He studied at Oxford; but of his early university career nothing is known.

W. first emerges into public notice in 1361, when his name appears as master of Balliol Hall—as Balliol College was then called. In May of the same year he was instituted to the rectory of Fyllingham in Lincolnshire, and shortly after resigned his mastership and went to reside at his rectory. About 1363 he took his degree, and began to read lectures on divinity at Oxford, in which his anti-Romish views were first expounded. In 1368, he exchanged the rectory of Fyllingham for the living of Ludgershall, in Bucks; and in 1374, was presented to the parish of Lutterworth, of which he remained priest till his death.

In the great struggle maintained by Edward III. and his parliament against the pretensions of the papacy, regarding the exaction of certain tribute-money which had been granted by King John in acknowledgment of the fealty of the kingdom to the Roman see, W., who had been advanced to be one of the king's chaplains, was called upon to reply to a defence of the papal claim, which had been anonymously sent abroad. This he did publicly at Oxford in an ingenious and powerful manner, and thus early showed his antipathy to the pretensions of Rome. A clear evidence of his growing reputation is furnished by his appointment, in 1374, as second in a commission sent to Bruges to confer with the papal legate as to certain abuses on the part of the papacy complained of by the English parliament. It was probably on his return from this mission, that W. was promoted to a prebend in the diocese of Worcester, and at the same time presented to the rectory of Lutterworth in Leicestershire. Here he labored with great zeal, preaching not only on Sundays, but on the several festivals of the Church, and shewing himself "a most exemplary and unwearied pastor." Here also he began at length to speak his mind as to the papacy. The insight into papal doings which he had received at Bruges seems to have confirmed suspicions previously forming in his mind, and he is said, soon after his return to England, to have styled the pope "Antichrist," "the proud worldly Priest of Rome, the most cursed of Clippers and Purse-kervers" (cut-purses). Then began in real earnest his troubles with the hierarchy. In the beginning of 1378, he was summoned to a meeting of Convoca-

tion, to be examined for his opinions. He obeyed the summons, but he appeared attended by his friend John de Gaunt and others. A great tumult ensued, the London citizens bursting into the chapel, and frightening the synod of clergy, who were ordered to sist proceedings. The papal authority was then invoked against him, and Gregory VI. issued several bulls, three addressed to the Archbishop of Canterbury and other bishops, one to the king, and one to the university of Oxford, commanding an inquest into the erroneous doctrines attributed to the Reformer. W. was accordingly again summoned before the prelates at Lambeth; but on this occasion also he was favored by circumstances, and escaped merely with an injunction to refrain from preaching the obnoxious doctrines.

These proceedings only served to make W. a more thorough Reformer. He now entered upon his great work of translating the Scriptures, and circulating them among the common people. He had a great retinue of poor preachers, who went from village to village bearing copies of parts of them. He also challenged the doctrine of transubstantiation. Many of the people, the burghers and the middle class, heard him gladly, and matters seemed tending to an open rupture with the papacy. But the times were not as yet ripe for this. Many who otherwise sympathized with the Reformer were afraid of his views about transubstantiation. He was especially summoned to answer on this head, first, before a synod at the Greyfriars, London, and finally before Convocation in 1532. He appeared, and defended himself with great subtlety and power. His defence was unavailing. Twenty-four "erroneous" statements were picked out of his works, which were in consequence condemned and ordered to be burned. He was banished from Oxford, but was allowed to retire to his parish of Lutterworth. His health was already shattered by hard work and many anxieties, and on the last Sunday of the year 1534 he was struck down by paralysis while conducting public worship, and two days afterwards expired. W. appears to have been a man of simple faith and manly courage. He made a strong impression upon his age; an impression there is reason to think not entirely effaced even to the time of the Reformation. The Lollards, as his disciples were called, were to be found not only among the poor, but in the church, the castle, and even upon the throne. Political misadventures, however, overtook the party in the following century, and only a few traces of it survived here and there when the movement of the 16th c. began.—See HUSS. T. Arnold published 3 vols. of W.'s select works in 1871. The "Trialogus" was edited by Lechler in 1869. See Lechler's "W.," trans. (1866) by Lorimer.

WIDDIN, or VIDIN, formerly an important Turkish fortress, in the recently constituted principality of Bulgaria, on the right bank of the Danube, 140 miles from Belgrade, and is surrounded on all sides by morasses. Its streets and bazaars are pestiferously dirty. For centuries W. has been a strong post in all the contests between the Turks and their neighbors, and it was called by the Turks the Virgin Fort, from its never having been taken. W. has thriving industries and trade. The Berlin Congress of 1878, which erected Bulgaria into a principality, determined that the extensive fortifications of W. and other Bulgarian fortresses should be demolished. Pop. about 25,000.

WIDGEON, or Widgeon (*Mareca*), a genus of ducks of the non-oceanic section, with the hind toe not webbed, having the bill shorter than the head, and of equal width throughout, much rounded at the tip, with a broad strong nail; the lamellæ of the upper mandible prominent; the wings long and pointed; the tail wedge-shaped. The species are pretty numerous, migratory birds, appearing in great flocks in the warmer countries which they visit during the winter. The COMMON W. (*Anas* or *Mareca penelope*) is plentiful in Britain during winter. A few breed in the most northern parts of Scotland, but the ordinary breeding-place is in more northern regions. This species is found at some season of the year in almost all parts of Europe, and in Asia as far south as the north of India. It is found also in North America, along the Atlantic coast. It is known as one of the birds of Japan. Its whole length is about 18 inches. The forehead and top of the head in the male are white, the cheeks and hind parts of the neck reddish chestnut; the upper parts grayish white, crossed with irregular zigzag lines of black; the tail nearly black; the wing-coverts white, tipped with black; the primaries dark brown; a green speculum edged with black; the throat

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pale rufous: the breast and belly white. The female is very different, the head and neck rufous brown, speckled with dark brown; the back varied with two shades of brown, darker in the centre, and paler in the edges of the feathers. The W. is the most common of all the duck tribe in Lapland, frequenting grassy swamps, lakes and rivers. Flocks of W. appear in Scotland and England, on lakes and rivers, in winter, and most abundantly in severe winters. They feed during the daytime, and chiefly on grass. The note of the W. is a shrill whistle, whence its French name *Sifleur*, and the English names, *Whew Duck* and *Whewer*. Its flesh is good for the table.—The AMERICAN W. (*Anas or Mareca Americana*) is a larger bird than the European W., being about 21 inches long. The upper parts are finely waved transversely with black and reddish brown, the under parts are mostly white; the top of the head is almost white; the wing coverts white, the greater tipped with black; the speculum green, encircled by black. It breeds chiefly in the northern parts of America, and is common in winter on the coasts of the United States, and in the rice grounds. Its flesh is highly esteemed. It is known as an occasional, but very rare visitant in the British Islands.

WIDOW (see *JUS RELICTÆ, SUCCESSION, MARRIAGE*). A widow's right to dower, by the common law of England, extends to a life estate in one-third of the lands and tenements of which her husband died seised, and which any issue she may have had might by possibility have inherited. The law of dower was considerably altered by a statute 8 and 4 Will. IV. c. 105; and in cases where married parties are entitled to real property, their rights are generally regulated by contract. There are certain modes of conveying and devising property so as to prevent dower arising, and a widow's right to dower is also generally prevented by giving her a jointure. A woman loses her dower by a divorce, but not by judicial separation or other misconduct.

WIELAND, Christoph Martin, one of the greatest of German poets, was born, 5th September 1733, at Oberholzheim, near Biberach, his father being pastor of that place and afterwards in Biberach itself. The precocity of his powers early excited attention, and when only 12 years of age, he had essayed his poetical talent both in Latin and in German verses. In 1750, W. went to the university of Tübingen to study law, but occupied himself more with the classics, and with recent literature, both native and foreign. From Tübingen, he returned to Biberach in 1752. At this time, Klopstock's example had an extraordinary influence on him, so that he gave himself up to a mystical piety, foreign to his nature, which he gives utterance to in the "*Empfindungen des Christen*" (The Christian's Experiences). While in this mood, an invitation from Bodmer led him to give up the intention of graduating at Göttingen, and go to Zürich. The number and nature of his productions at this time show the effect which the example of Bodmer's desultory way of working was beginning to have upon him. He soon, however, returned to the more congenial field of the literature and life of the Greeks. The lively interest which he took in Frederick the Great, prompted W. to work out the ideal of a hero in a great poem, for which purpose he fixed on Cyrus. The first five cantos appeared 1757, and a new edition 1759; but the reception it met with was not very cordial, and consequently it remained unfinished. The beautiful episode from the "*Cyropaidea*" of Xenophon, "*Araspes und Pauthea*," appeared about this time, and revealed W. as the poet of love. In 1760 he received an appointment in his native town in connection with the law-courts. At this period, he engaged in the arduous task of translating Shakespeare (8 vols., Zur. 1762—1766). However little W., whose mind had been formed after Greek, Roman, and French models, and who was constitutionally inclined to pleasant and easy trifling, was calculated to enter fully into the spirit of Shakespeare, he nevertheless was, for his time, tolerably successful, and opened up the path for his successors.

W. now spent much of his time at Warthausen, near Biberach, the estate of the Count von Stadion, an accomplished and highly intellectual man, but thoroughly a man of the world, and adverse to all religious enthusiasm. From the tone of the society he met here, as well as by the course of his reading, W. became imbued with that modern French philosophy which runs through the most of his later writings. In some of these, there is an unmistakable tendency to licentiousness, from which his personal life always remained free; in most of them, however, he has blended

the Greek sensibility to outward impressions with the French love of pleasure into a peculiar graceful philosophy of life. The first production which bears the impress of this French-Greek sensuousness, was the poetical tale "Nadine," which he himself calls a creation in Prior's manner. In 1766 and 1767, "Agathon," a romance in 3 vols., made its appearance, which greatly contributed to establish W.'s fame. His views on the subject of love are most fully and worthily expounded in the didactic poem "Musarion" (1768), a work of singular grace and harmony of treatment, which he himself called a philosophy of the Graces. W. had, in the meanwhile (1765), married a lady of Augsburg, and accepted a call to Erfurt (1769), as Professor of Philosophy in the university. He terminated what may be called the erotic period of his literary career with the "Verklugter Amor" (The Impeachment of Love), wherein he, in a manner, vindicated the kind of poetry to which he had till then devoted himself.

A period of delightful leisure and undisturbed work began for W. when the widowed Duchess Anna Amalie invited him to Weimar (1772), as tutor to her two sons, with the status of Hofrath, and a salary of 1000 thalers, which was continued to him after his duties as tutor ceased. W. was entirely in his own place in the society of the distinguished men (such as Musäus and Von Eberle) already gathered round this court; and his genius began to soar more courageously. He wrote his *vandeville*, "Die Wahl des Hercules" (The Choice of Hercules), and the lyrical drama, "Alceste" (1778), which were received with great approbation. Of greater importance for German literature was the publication of the "German Mercury," a monthly periodical, to which W., till towards the close of his life, devoted himself with the greatest earnestness, and which he made the vehicle for disseminating his æsthetical views. On the whole, however, his criticism was neither genuine nor very deep, and suffered from that conventional narrowness which was then dominant in France. His letters on his "Alceste" in the "Mercury" (September 1778), contain sufficient traces of this tendency, at which Goethe and Herder were so much offended. The former wrote in relation to it the satire "Götter, Helden und Wieland" (Gods, Heroes, and Wieland). W. answered the attack with pleasantry and with his characteristic good nature. Shortly afterwards Goethe himself joined the circle at Weimar, the soul of which was the Duchess-mother, Anna Amalie. W.'s literary powers developed themselves here more and more; and for more than 20 years almost nothing of any importance occurred, either in the political or literary world, in which he did not take a more or less active part. His literary productiveness showed itself chiefly in the "Geschichte der Abderiten" (History of the Abderites, 1778), a charming work, depicting the follies of small communities, in which the muse of Wisdom is disguised under the garb of the Satyr. This was followed by a series of tales and stories, partly imitations of foreign originals, and partly of his own invention. "Oberon," a romantic heroic poem, the most perfect and enduring of his greater works, appeared 1780 (last ed. Leip. 1853). It was followed by the translation of Horace ("Letters," 1782; "Satires" (1786), and of Lucian (1788). W. pronounced the Epistles of Horace with the commentaries to be those of his works on which he put the greatest value. He has given us a complete sketch of his conception of the Greek world in the "Aristippe" (1800). A collected edition of W.'s works up to 1802, in 36 vols., with 6 supplementary vols. in large quarto, and large and small octavo (new edition, with the poet's life, 55 vols., 1823; 86 vols., 1839), was got up by the bookseller Göschen in Leipzig. From the proceeds, W. was enabled to buy the estate of Osmannstadt, near Weimar. From 1798 to 1803, he lived here in the circle of his numerous family (his wife in the course of 20 years had brought him 14 children), and devoted the greatest part of his time to literary labors, among which his "Attic Museum" (1796—1804), and the "Neue Attic Museum" (1805—1809), were not the least. In these publications, he strove to make his countrymen familiar with Greek poetry, philosophy, and rhetoric. In 1803, he sold his estate, and returned to Weimar, where he very soon became intimate with Schiller. Here he lived to see the day of the battle of Jena, the death of the Duchess Amalie, and also of Herder and Schiller. The marks of honor which he received from Alexander and Napoleon, and his admission to the French "Institut," helped to alleviate his many griefs, among which one of the greatest was the death of his wife, 1801, with whom he had

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lived for so many years in great happiness. His own death took place 20th January 1818.

W. had neither the spirit of a reformer like Klopstock and Lessing, nor did he attain the poetical greatness of Goethe or Schiller; nevertheless, he did great service to German literature, which has not always been sufficiently recognised. He gave to German poetry, as it was rising into true national importance, the still wanting grace and harmony of expression and versification, in which respect Goethe learned much from him. The poetic handling of mediæval chivalry was an entirely new creation of his, and thus the school of romantic poetry is indebted to him for its origin. He also introduced poetical materials from England, France, Spain, and Italy, which were not without influence. In all his appropriations W. exercised that fine discernment which seizes upon what is universally human, so that he nowhere appears as a blind imitator. His criticism, too, with all its shallowness, contributed much to the diffusion of general culture.—Compare, besides Gruber's "Biographie Wieland's" (4 vols., Leip. 1827; vols. 50–53 of the "Works"), "Wieland's ausgewählte Briefe" (4 vols. Zür. 1815), "Auswahl denkwürdiger Briefe" (2 vols., Wien, 1815), and "Briefe an Sophie Laroche" (Berl. 1820); also Löbell's "C. F. Wieland" (1859).

WIELICZKA, a small town of Austrian Galicia, 10 miles directly east-south-east of Cracow, and the same by railway. It is remarkable for its salt-mines, in which the majority of its inhabitants (4945 in number in 1869) are employed. The mines were discovered in 1250, and have been continuously worked since that time; though some assert that there is abundant evidence to prove that they have been worked since the 9th century. The town itself is entirely undermined by the excavations, which extend upwards of 9500 feet from east to west, 3000 feet from north to south, and are 1780 feet in depth. The mines extend to four stories or "fields," one below the other. In the second story, the visitor is rowed across a salt lake, and when he has reached and is exploring the third story, he is informed that the lake he lately crossed is now right above his head. The stories are simply large chambers excavated in one enormous mass of rock-salt, of great purity, and apparently of inexhaustible extent. In one of the chambers, the miners have scooped out a Gothic chapel, and skillfully carved a number of statues and obelisks, from the solid rock-salt. The mines produce 61,500 tons English per annum.

WIEßBADEN, chief town in the Prussian district of the same name, in the province of Hesse-Nassau (formerly the independent duchy of Nassau), one of the oldest and most famous of the German watering-places, delightfully situated on the south slopes of Mount Taunus, 26 miles w. of Frankfurt, and 5 miles n.-w. of Mainz by railway. The town has been called "a city of lodging-houses," and this may be understood from the fact, that during the "season" the number of the visitors is greater than of the resident inhabitants. But though almost every house is appropriated to the reception or entertainment of guests, the town is well and regularly built. The *Kursaal* comprises an extensive dining-hall, in which frequently 800 people sit down to dinner, and which also serves as a ballroom, together with good reading-rooms, &c. In the large gardens behind the *Kursaal*, it is the habit of the visitors to sit in the evenings at the numerous small tables, regaling themselves with coffee or ices—the men smoking, the women knitting—and all either chatting or listening to the music played by a band on such occasions. Other buildings are the *Schlosschen* (Little Palace), containing a library of 60,000 vols., and a collection of antiquities, in which are a number of curious Roman *bass-reliefs*, statues, altars, &c., found in the vicinity; the handsome Protestant church, finished in 1800; the superb Greek chapel, built by the Duke of Nassau as a mausoleum, in which repose the remains of his first wife. There are 14 hot springs, all of a high temperature, and numerous bathing-houses throughout the town; but the principal is the *Kochbrunnen* (Boiling spring), the temperature of which is 156° Fahr. The spring has all the appearance of a boiling caldron, and so copiously does it pour forth its waters, that though they are used both for drinking and to supply the principal baths in the town, a vast quantity escapes and runs away through gutters and drains, sending up clouds of vapor in its passage along the streets, and adding to the warmth of the temperature of W. in summer. Next in heat and volume to the *Kochbrunnen* is the spring that rises in the garden of the Adler (Eagle) Hotel, the temperature

of which is 184° Fahr. The use of the W. hot springs is considered highly efficacious in cases of gout, rheumatism, scrofula, and other skin diseases and nervous affections. The waters of these springs are saline, and contain silica and iron. The prosperity of W. is entirely due to its springs; and the beauty of its situation and environment, the agreeable walks and rides, and the never-falling gaiety that prevails during the season, render it one of the most popular of the spas. The season lasts from June to September, and, though the public gaming-tables were abolished in 1872, the number of visitors annually is near 40,000. Pop. (1875) 43,674.

W. is very ancient; its springs are the *Fonles Mattiaci* mentioned by Pliny. The Romans built a station here, and erected a fort on a hill on the north-west side of the town, still known as the Römerberg, and which was garrisoned by the 22d Roman Legion. The *Mattiaci*, a subdivision of the German tribe called the *Catti*, allied themselves with the Romans; but in the 8d c. the barbarian Germans rose against the Romans, and destroyed their forts, including Wiesbaden. Urns, tiles, colus, &c. are found abundantly whenever the foundation of a house is dug; and that the Romans appreciated the virtues of the waters is proved by the remains of ancient baths that have been found, and by the votive tablets recording the thanks of Romans who had been restored to health by the waters, still preserved in the museum.

WIG (Lat. *pilus*, the hair *pilare*; to pluck off the hair; from which was formed *pilucare*, and hence, *pilucca*, a head of hair; this was transformed in Ital. into *perucca*, French *perruque*, whence Eng. *perwig*, shortened into *wig*). The use of false hair for concealing baldness, or for the supposed adornment of the head, appears to belong to all ages and countries. There is an Egyptian wig in the British Museum, supposed to be about 4000 years old; and some of the South Sea Islanders are said to be skillful wig-makers. Xenophon mentions that Astynges wore an immense wig. Several of the Roman emperors wore wigs, and Lampridius relates that the wig of the Emperor Commodus was highly perfumed, and sprinkled with gold dust. After this, there are no historical traces of the wig till about the end of the 14th c., when wigs made their appearance in France, and hence spread gradually over other European countries. The fashion of wearing wigs set in strong in the reign of Louis XIII. (1610–1643), and for more than a century no gentleman of fashion could appear without one. Such was the extravagance in this article of dress, that as much as three guineas an ounce was paid in England for fine qualities of hair, and wigs were made at a cost of £140. It was only towards the end of the 18th c. that the unnaturalness of this ornament appears to have been thought of, and it began to be superseded by the queue, with Hair-powder (q. v.). Except by judges and barristers, wigs are now used only in cases of baldness, and then they are made in imitation of nature, which was by no means the case with the wigs of old times.

WIGAN, a prosperous market and manufacturing town, and municipal and parliamentary borough, in Lancashire, on the Douglas, 15½ miles south-east of Preston, and about the same distance from Liverpool on the south-west, and Manchester on the south-east. Originally rather irregularly built, W. has for some years progressed rapidly in the improvement of its streets and buildings. It is well sewered and liberally supplied with water. The parish church of All Saints is an ancient stately edifice, and has recently been almost entirely rebuilt. There are 21 churches belonging to the Establishment; 9 Roman Catholic, and 21 other dissenting places of worship. W. stands in a coal-field, where cannel coal abounds. Cotton-spinning, the manufacture of calicoes and other cotton goods, checks, and home-made flannels, are extensively carried on. There are also brass and iron foundries, factories for edge-tools, chemical works, paper-works, and corn-mills. The river Douglas, and the Leeds and Liverpool Canal, afford facilities for inland navigation. Pop. (1871) 89,110.

WIGHT, Isle of, an island in the English Channel, remarkable for the variety and beauty of its scenery, and the mildness and salubrity of its climate. Lies almost centrally, close off the southern coast of England, in which it is partially embayed, and is divided from it by a channel varying from less than 1 mile to more than 6 miles in breadth, known as the *Solent* (q. v.), which spreads out to the east into the broad and safe anchorage of *Spithead* (q. v.) and *St Helen's Roads*. Its form is remarkably

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regular, its longer and shorter diameters (33 miles, 5 furlongs, and 13½ miles in length respectively) running almost due east and west, and north and south. Its shape is rhomboidal, and has been compared to a bird with expanded wings or to a turbot. It is 56 miles in circuit, and embraces an area, including its inlets, of 98,330 acres. Pop. (1871) 66,165. *Newport*, which returns one member to parliament, the island returning one, is the capital; the other chief towns are *Ryde*, *Cowes* and *Ventnor* (all described under their separate headings), of which the first and last have sprung up from small villages within the present century. *Yarmouth* is a small decayed town near the western extremity of the island, formerly returning two members, a privilege once also possessed by *Newtown*, on the north-west coast, a once important town, now sunk to an insignificant hamlet. On the south-east coast, the delightful health-resorts of *Sandown* and *Shanklin* have lately acquired the size and importance of towns. Railway communication has been opened between *Ryde* and *Ventnor*, and between *Cowes* and *Newport*. Throughout the island there are good though generally narrow roads, for the most part picturesque and bounded by hedgerows. The chief physical feature of the island, to which it owes its shape and much of its beauty, is a long undulating range of chalk downs, extending, as a kind of backbone, from the *Culver Cliffs* on the east, to the *Needles* on the west, rising to its greatest elevation in *Mottistoun Down*, 661 feet (*Ashey Down* is 424 feet, and *Bembridge Down* 355 feet) above the sea. The river *Medina*, rising near the southern extremity of the island, flows north through a gap in this range, expands into a tidal estuary below *Newport*, and flows into the *Solent* at *Cowes*, and divides the island into the hundreds of the East and West *Medina*. In addition to the central ridge, a second range of chalk downs of greater elevation—*St Boniface Down*, 783 feet, *Dunnowe* (*Shanklin Down*), 771 feet, *St Catherine's*, 769 feet—rises at the southern point of the island, and expands into a broad promontory, the south face of which forms the picturesque district known as the *Undercliff*, or "Back of the Island," of which *Ventnor* is the capital. This district owes its remarkable beauty to a series of land-slips on a gigantic scale, of pre-historic date, which have laid bare a long wall of rugged cliff, below which a succession of sunny terraces, due to the gradual subsidence of the strata, slope gently down to the sea. The whole of this part of the island is completely sheltered from the colder winds, and enjoys a well-merited reputation as a residence for invalids suffering from consumption or any disease of the respiratory organs. Its remarkable healthiness is attested by the returns of the registrar-general, which prove that the death-rate of the district is absolutely the lowest in the kingdom; while the mildness of its climate is evidenced by the luxuriance of the myrtles, fuchsias, sweet-scented verbenas, and other exotics, which live through the winter without protection.

In a geological point of view, the Isle of W. is most interesting. The great variety of strata displayed within so small an area, under circumstances so favorable for examination, renders it one of the best available localities for the young observer. The north side of the island presents a succession of Tertiary or Eocene strata, including beds of fresh-water limestone, which have been extensively worked for building-stone for many centuries, and based on beds of London and Plastic Clay. In *Alum Bay*, at the west extremity of the island, the rapid succession of vertical layers of sand and clays of bright and varied hues, produces a singular and beautiful effect. The central ridge or backbone consists of strata of chalk imbedded layers of flints, and the underlying formations in an almost vertical position. Isolated masses of chalk that, in consequence of their superior hardness, have survived the marine and atmospheric waste, form the well-known *Needles*, at the west opening of the *Solent*, and the picturesque rocks of *Freshwater Bay*. The downs at the south of the island belong to the same formation, but here the strata have been undisturbed, and are nearly horizontal. The cliffs of the *Undercliff* are of the Upper Green-sand, or *Firestone*, underlying the chalk. Below this comes the *Gault*, or *Blue Marl*. To the action of the land-springs upon this unctuous formation, the land-slips to which the Back of the island owes its beauty are due. The lower Green-sand succeeds the *Gault*, occupying the greater part of the area between the north and south chalk downs. This forms excellent corn-land, and presents a wall of cliff to the sea, diversified with many narrow picturesque gorges, locally known as *Chasms*, where a small rivulet has eaten away the friable strata. The chief of these are those of

Shanklin, Luccombe, Blackgang, and Whale Chine. The freshwater Wealden formation is the lowest visible in the island, and is seen in the cliffs of Brook to the west, and of Redcliffe Bay to the east. Bones of the colossal iguanodon and other saurians are found in this formation.

The soil of the island is very varied, both in nature and fertility. That of the northern half is, to a considerable extent, a cold, stiff clay, more suited for the growth of wood, especially oak, than corn. Of late years, however, much of the woodland has been cleared, and judicious draining operations, in which the late Prince Consort led the way on the royal domain of Osborne (near East Cowes), have produced very beneficial results. Farming is still on the whole somewhat primitive; even on large farms the flail may still be seen in use. The soil of the south half is chiefly a red loam, which is exceedingly productive, especially in crops of barley, and, in the more rich and sheltered lands, of *white* wheat. *Red* wheat is grown in abundance in other parts of the island; while the stiffer clays of the north grow capital crops of oats. The chalk downs afford admirable pasturage for sheep, which are celebrated for the pureness of their wool, chiefly exported to Yorkshire, and which furnish the London market with early lamb. The chief exports are wool, corn, flour, cement stones (septaria), and white glass-house sand. The principal communication between the mainland and the island is by steamboats plying daily between Portsmouth and Rhyde, at both of which places there are good landing-piers.

The history of the Isle of W. presents but comparatively few points of interest. It is supposed, with much probability, to have been the tin mart of the Greek traders mentioned under the name of *Ictis* by Diodorus Siculus. The Romans knew it as *Vecta* or *Vectis*, which is merely the Latinised form of the native name. It was conquered for the Romans by Vespasian in the reign of Claudius (43 A.D.). Cerdic, the founder of the kingdom of Wessex, took the island 530 A.D., and handed it over to his nephews, Stuf and Wiltgar. In 661 A.D., it was reduced by Wulphere of Mercia, and given to Ethelwold, king of Sussex, from whom it was wrested (686 A.D.) by Cenwilla of Wessex, to whom, under the benign influence of Wilfrid, Archbishop of York, the island owes the introduction of Christianity. During the three centuries preceding the Norman Conquest, it was repeatedly devastated by the Danish pirates, who made it their stronghold, to which they retired with their plunder. William the Conqueror gave it to his kinsman, Fitz-Osborne; Henry I. transferred it to the family of De Redvers, in whose hands it remained till the reign of Edward I., when it passed by sale to the crown. During the French wars of Edward III. and his successors, the island was repeatedly invaded and pillaged by the French. At the close of the reign of Henry VIII., the armada despatched by Francis I., under the command of D'Annebault, made several landings on the coast, and inflicted some damage, but were ultimately driven back by the prowess of the islanders. The most interesting event in the history of the island is the imprisonment of Charles I. in the castle of Carisbrooke, after his flight from Hampton Court, from November 23, 1647 to September 15, 1648. Carisbrooke was also the place of the imprisonment of his children, Prince Henry and the Princess Elizabeth, the latter of whom died there, and was buried in Newport Church, where a beautiful monument by Baron Marochetti has been erected to her memory by Queen Victoria.

Among the celebrated natives of the Isle of W. we may notice Dr Robert Hooke, the experimental philosopher, born at Freshwater, 1635; and Dr Thomas Arnold of Rugby, the regenerator of public-school education, born at East Cowes, 1795.

The antiquities are not numerous. Sepulchral barrows occur on the downs, and Saxon burial places have been discovered in several localities. There are the remains of a Roman villa with a tessellated pavement, at Carisbrooke. The remains of Quarr Abbey, near Ryde, are very scanty. Carisbrooke Castle is a fine ruin, occupying a commanding position. The churches are picturesque, but not remarkable for beauty of architecture. There are but few monumental brasses or other sepulchral memorials of interest.

WIGTON, a market and small manufacturing town of Cumberland, in the midst of a specially agricultural district, $11\frac{1}{2}$ miles by railway southwest of Carlisle. It carries on manufactures of gingham and checks. Pop. (1871) 8425.

WIGTOWN, a county forming the south west corner of Scotland, is bounded on

the w. by the Irish Channel, n. by Ayrshire, e. by the Stewartry of Kirkcudbright and the Solway Firth, and s. by the Irish Sea. Its extent from east to west is computed at from 33 to 34 miles, and from north to south 24 to 25 miles. This county, which constitutes West Galloway, was formed about the year 1341; and is between 54° 38'—55° 4' n. lat., and 4° 16'—5° 6' w. longitude. W. is somewhat irregular in form, being deeply intersected by two arms of the sea, one of which, Loch Ryan, a long narrow inlet, stretches southwards from the north-west corner for fully 9 miles into the county, while Luce Bay on the south makes a wide indentation 18 miles long with an average of 12 wide, the heads of the inlet and bay being only 6 miles apart. The western part of W., known as the *Rhins of Galloway*, thus forms a peninsula whose length (from north to south) is 28 miles, and breadth 1½—6 miles; its northern extremity is Corsewall Point, and its southern the Mull of Galloway, each promontory being provided with a light-house. The south-eastern half of W. is separated from the Stewartry by Wigtown Bay, 15 miles long and 14 wide at its mouth, and between this latter and Luce Bay, W. extends southwards in a blunt triangular form, terminating in Burrow Head. The inhabitants of W. were originally of Celtic origin, and up to the middle of the 16th c. a Celtic dialect was universally spoken; and for a century afterwards, it was in use in the remote districts. W. is irregular in its surface, but its eminences are inferior in height to those of any other county of Scotland—none of them exceeding 600 feet. The soil is varied, and—with the exception of a portion lying along the sea-shore, especially in the south-east, which consists of a rich loam—the quality is mostly inferior. There is a large extent of moss and moor, mostly of a very poor and unproductive nature, judging from the appearance and produce of much of what has been reclaimed. There has, however, been a considerable improvement made of late years in farm buildings. The climate is rather mild, but moist, the rainfall being comparatively great. There are many dairy establishments in this county, almost exclusively for making cheese similar to the Somersetshire cheddar. The cows are frequently let for hire at from £9 to £12 per cow, the farmer supplying all food, and the dairyman the labor. Most of the cows are of the Ayrshire breed; it is difficult to obtain the pure native breed of cattle; and the Galloway pony, formerly in such vogue, is now hardly to be met with. The area of W. is over 512 sq. m., or 327,906 acres, of which about three-fifths would be unprofitable to reclaim. The government returns for 1870 give 144,506 acres under all kinds of crops, bare fallow, and grass; under corn crops, 38,581; under green crops, 19,065; clover, sanfoin, and grasses under rotation, 45,040; permanent meadow pasture, 41,375. There were 5543 horses for the use of agriculture; also 39,988 cattle, 127,627 sheep, and 8963 pigs.

Besides numerous small streams, W. contains three rivers of considerable size: the Cree, which forms the eastern boundary, and the Bladnoch—both of which fall into Wigtown Bay—and the Luce, which empties itself into Luce Bay; the former two are navigable for a few miles, and yield salmon and trout. The county also possesses several small fresh-water lochs. In the Rhins of Galloway, on the south-west, is situated the parish of Kirkmaiden, the most southerly point in Scotland—hence the saying “from Maldenkirk to John o' Groats.” There were at an early period a considerable number of religious houses in the county; and the church, believed to be the oldest in Scotland, founded by St Ninian, was built near the site of what is now the village of Whithorn. At the Reformation there were 21 parishes; the number was reduced to 17, but is now 20. The principal towns are Wigtown, Newton-Stewart, Stranraer, and Whithorn. There is no mineral wealth, and little trade or manufacture carried on in W. There is a distillery at Bladnoch, a woollen manufactory at Kirkcovan, and some saw-mills and starch-mills at Stranraer and elsewhere. The mail-coach was first run through W. in 1804, and was only superseded by a railway from Castle Douglas to Port Patrick in 1857. A line from Ayr now connects with this railway, and a branch runs to Whithorn. The valued rent of W. in 1674 was £5634; the valuation for 1877—1878 was £245,113. Pop. (1871) 38,880; parliamentary constituency (1877—1878) 1622.

WIGTOWN, a royal, municipal, and parliamentary burgh, market-town, and seaport in the south-west of Scotland, capital of the county of Wigtown or West Galloway, is situated on Wigtown Bay, near the mouth of the Bladnoch Water. It is 40 miles west-south-west of Dumfries, and nearly 130 miles distant by railway

from Edinburgh. The parish church was erected in 1859. It is of Gothic architecture, and much superior to the ordinary run of country churches. In the churchyard there are three tombstones in memory of martyrs who suffered in the time of Episcopal persecution. Two of them are old. On the summit of the Windyhill, the highest ground in the neighborhood of the town, an obelisk of freestone was placed some years ago, in memory of these same martyrs—two of whom, women, are said to have been drowned here. The authenticity of this event, though lately questioned by some, is doubted by very few in the locality where it is said to have happened. A large and very handsome building, which is used as a town-hall and court-house, was erected in 1868. Pop. (1871) 1780. There is no particular trade carried on in the town. At Baddoch Bridge, however, which is held to be part of the burgh, although nearly three-fourths of a mile distant to the south, there is a distillery of considerable extent; also an iron foundry and a coach-building establishment. W. unites with Whithorn, Stranraer, and New Galloway in electing a member to the House of Commons. The registered tonnage of the port in 1872 was 2271.

WIKANA, the *Waoaka des Indes* of the French, a dietetic preparation of cacao much used in France for invalids. It consists of roasted cacao nibs and sugar, in the proportion of three parts of the latter to one of the former, well mixed together, and flavored with cinnamon, vanilla, ambergris, and musk.

WILBERFORCE, William, was born at Hull, on 24th August 1789. His father was a wealthy merchant, descended from an old family, proprietors of Wilberforce, in the East Riding of York. W., at the age of 9, on his father's death, was sent to school at Wimbledon, where, under the care of a pious aunt, he ran the risk of becoming a Methodist. But his mother did not approve of a serious education, and removed him to a Yorkshire school, where the religious impression he had received were soon dissipated by a life of gaiety. His constitution was delicate, but he was quick and spirited, and fond of society, in which his lively conversation and musical talent made him a great favorite. While at school, he addressed a letter to a York paper "in condemnation of the odious traffic in human flesh," a subject he seems never afterwards to have lost sight of. At 17, he entered St John's College, Cambridge, and in due time he passed his examinations with credit. He came, on attaining his majority, into possession of a large fortune, and determined to enter parliament. In 1790, he was returned for Hull. He had known Mr Pitt when at Cambridge, and in London they became inseparable friends. W., in parliament, however, remained independent of party. The elevation of Mr Pitt to the premiership gave him an opportunity of taking office, but he declined to do so. He rendered, however, efficient service to his friend. In March 1784, on the eve of a dissolution, he spoke at a county meeting in York, called to vote an address against the Coalition Ministry; and such was the effect of his eloquence, that when he had concluded, a resolution had been come to by the freeholders that he should be asked to stand for the county. He did so; and in spite of opposition from the great Whig families, he was returned without a contest. W.'s success in the leading county, set an example to other constituencies, which was of very great advantage to the Pitt ministry. In the same year W. made a tour on the continent with some ladies of his family and Isaac Milner, the Dean of Carlisle, during which the serious impressions of his youth seem to have been revived. In 1787, he in a great measure eschewed gaiety, and founded an association for the discouragement of vice; and in the following year, while in very bad health, he entered on his great struggle for the abolition of the slave trade, to which he thenceforward dedicated his whole time. He was powerfully supported by the Quakers, and by Mr Thomas Clarkson, who kept alive the interest in the subject beyond the walls of the House of Commons. In 1789 he first proposed the abolition of the slave-trade in the House of Commons, and met, as he expected, with powerful opposition. In 1804, his bill was first carried through the Commons; it was thrown out in the Lords; and in the following year it was again lost in the Commons. In 1806, however, a resolution was moved by Mr. Fox, pledging the Commons to a total abolition of the slave-trade in the following session. It was adopted by the Lords. Just before the discussion began in January, 1804, a work had been published by W. against the slave-trade, which had a marked influence on public opinion and the subsequent debates. The bill was passed by the Lords. In the House of Commons it was carried by an enthusiastic majority.

Wildbad
Wild-Fowl

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Sir Samuel Romilly, who supported the measure, compared the feelings of Napoleon, then at the height of his glory, with those of the great English philanthropist, "who would that day lay his head upon his pillow, and remember that the slave-trade was no more;" and the whole House burst into applause, and greeted W. with enthusiastic cheers. W. now sought to secure the abolition of the slave-trade abroad. He at the same time entered on an agitation for the total abolition of slavery itself. Declining health, however, compelled him in 1825 to retire from parliament, in which, since 1812, he had sat for the borough of Bramber. The movement against slavery was then intrusted to Sir T. Fowell Buxton. Three days before W.'s death, news was brought him that the Abolition Bill had passed a second reading, and he thanked God he had lived to see his countrymen spend 20 millions sterling in such a cause. He died 29th July 1783, and was buried as a national benefactor in Westminster Abbey. In 1797, W. married the daughter of Mr J. Spooner, the banker of Birmingham, by whom he had a large family. W. is the author of a "Practical View of Christianity," which, on its publication in 1797, met with great success.—See the "Life of Wilberforce," by his son. His third son, Samuel (born 1805, died 1873), became bishop of Oxford in 1845, and bishop of Winchester in 1869. He distinguished himself in parliament by his eloquence, and was author of a "History of the Episcopal Church in America," "Agathos," and "The Rocky Island," allegories, sermons, &c.

WILDBAD, a small town of Würtemberg, in the Black Forest, romantically situated in a valley watered by the Enz, about 22 miles south-south-east of Carlsruhe, 18 miles of which are by railway to Pforzheim, and the remaining 14 by road, through a beautiful portion of the Black Forest. It is noted for its thermal springs and baths, the water of which ranges from 93° to 100° F. in temperature. The baths consist of numerous basins formed round the springs as they gush from the rocks, and floored with sand for the comfort of the bathers. From the circumstance that these baths are natural, or *wild*, and not artificial, the town derives its name. The waters are nearly pure, the principal ingredient they contain being common salt. They are peculiarly beneficial for rheumatism, gout, stiffness of limbs, paralysis, &c., and for some skin-diseases. The season lasts from May till September, and the number of visitors has steadily increased from 470 in 1830 to about 5000 annually. Goutte abounds here and in the neighboring close valleys of the Black Forest. Pop. (1871) 2049.

WILD-FOWL, a popular term, synonymous with *Water-fowl*, and generally applied to web-footed birds, but sometimes employed also to include herons, plovers, and other birds which frequent rivers, lakes, and sea-shores. The different kinds are noticed under their proper heads.—*Wild-fowling* is one of the most difficult, and yet one of the most interesting pursuits of the British sportsman. *Rock-fowling* (see FOWLING) is not included under this term. Wild-fowling is prosecuted in a great variety of ways. The wild-fowler seeks his game with a gun and dog, generally a retriever; or he uses a small boat, called a *punt*, adapted to the shallow waters in estuaries which wild-fowl frequent; or he proceeds a little further to sea, in a boat with sails; sometimes he employs a yacht, or he endeavors to approach his game on land by the aid of a *stalking-horse*; or he has recourse to decoys, and other contrivances, by which great numbers of wild-fowl are captured. It is chiefly on the eastern and south-eastern coasts of England that wild-fowl abound in Britain, and they are most abundant in severe winters, coming as migratory birds from the north; but the draining of the fen-lands has greatly reduced their numbers. The ancient Greeks and Romans captured wild-fowl by various kinds of nets, one of which, called the *argumentum*, was not unlike the modern decoy-pipe, the birds, however, being generally driven, and not lured into it. The *panthera* was a large purse or drag-net, placed along the banks of rivers. The ancient wild-fowlers sometimes practised a system of decoying, apparently less perfect than the modern system, but essentially of the same nature, enticing the birds to their snares by movements intended to excite their curiosity, and for this purpose the fowlers clothed themselves in feather jerkins, and danced with peculiar motions and gestures. Nooses and bird-lime were also much employed in ancient times. The Egyptians made much use of the *throw-stick*, a missile similar to the boomerang of the Australians, and which was dexterously thrown so as to hit the neck of the bird. In more recent times, falconry was much practised for

the capture of wild fowl. The gun, decoys, and flight-ponds are now chiefly in use. Although many wild-fowl are killed with the ordinary fowling-piece, it is not thus that the greatest numbers are obtained. Much larger guns are used in punts and yachts, by which many are killed at one shot. The *stalking-horse* is still used in some parts of England, in order to enable the wild-fowler, armed with an ordinary fowling-piece, to get within reach of the birds, whilst they are feeding on the level swampy ground which they chiefly frequent. A horse well trained for the purpose advances towards them, the fowler concealing himself on the side of it furthest from them. An ox is sometimes trained for this use, and indeed the kind of animal with which the birds are most familiar in the locality is most suitable. Artificial stalking-horses are sometimes employed, made of canvas, and stuffed with straw, the head being down, as if grazing. This practice is common in some parts of France. The use of the stalking-horse is very ancient. Wild-fowl shooting is not unattended with danger. In the pursuit of wounded birds on the ooze, the sportsman or fowler must use *splashes*, thin boards about 18 inches square, attached to the feet to prevent him from sinking; and if he falls, it is very difficult for him to regain his feet. He cannot raise himself by resting his hands on the mud, which only makes him sink deeper and deeper, nor can he do it by getting upon his knees. The only method is to roll over on the back, drawing the arms out of the mud, and placing one foot with his splasher firmly on the ooze, to press both hands on the knee of the leg so raised, and give a vigorous spring. The punter is also in great danger of losing himself in foggy weather when pursuing wounded birds, and being unable to get back to his punt, when a fearful death awaits him on the return of the tide.

The curly-coated retriever is the best dog for the wild-fowl shooter, but good training is necessary to fit the dog for his use. The punter ought not to carry a dog with him, because the dog, having no opportunity of exercise after his return from the water soon suffers from the cold of the winter weather in which the sport is pursued.

Sledging for wild-fowl is practised by professional wild-fowl shooters on some parts of the English coast, particularly that of Hampshire. The sledger traverses the ooze by means of a small light sledge called a *launching-punt* with a gun in the fore-part. He pushes it ahead, crawling on his knees, and often at full length on the mud, till he gets within range. His most severe work is on sands and dry ground.

The *gunning-punt* is a small generally flat-bottomed boat, about 17 feet in length, with a gun placed in the front of it, generally carrying about half-a-pound of shot at a charge. The punt must be nicely trimmed, so that the gun is nearly on a level with the surface of the water; and the fowler, having approached the birds where they are congregated, often kills great numbers by its discharge. The sport is pursued both by day and by night. The punt is generally constructed to carry only one person, and although he rows it in the ordinary manner till he discovers the birds, he is obliged then to lie down in the punt, and force it forward by a pole or by the oars with no little exertion, till he gets within range. The danger is not inconsiderable of his mistaking another punt in the darkness of night for an assemblage of wild-fowl, and firing at his fellow-sportsman. In a clear moonlight night he proceeds, if possible, against the light, so that he may see, and not be seen. By a successful shot, great numbers of water fowl are often killed. The punt-gun is capable of being *tipped*, that is, elevated so as to shoot water-fowl on the wing; and the most successful shots are often made by waiting till they rise, and tipping the gun. The punter cannot expect to recover all his wounded birds, and there are men on some parts of the coast who make their living during winter mostly by seeking for them in the morning.—The *sailing-punt* is a mere modification of the ordinary gunning-punt; the sail saving much hard work to the fowler, but its use is attended with greater danger, and it is utterly unsuitable for rough water. A *shooting-boat* is therefore sometimes used; but in it the gun cannot be fixed level with the surface of the water, as in the punt, and still more is this the case with the *shooting-yacht*. The practice of the sportsman is therefore considerably different, and the best shots are generally made after the birds are on the wing. The helmsman of the shooting-yacht must be quick and skillful in luffing up, in such

a manner as to cross the flight of the birds, that they may be well exposed to the gun, which is generally larger than the punt-gun. Great numbers of wild geese, swans, &c., are often killed from the shooting-yacht. In approaching the birds, the greatest caution is necessary, and the men in the yacht must be carefully concealed behind the bulwarks.

Notwithstanding the draining of the fen-lands, many of the decoys of the eastern coast of England are still very valuable, and in some instances, they afford a considerable part of the living of the parochial clergy. A good decoy-pond attached to a rectory adds not a little to its value. It is in severe winters that the decoy-pond is most productive. It must be in a secluded situation, and the proprietor takes care to keep it as secluded as possible, permitting no use of the gun or rifle in its neighbourhood. An extent of three or four acres is about the best for a decoy-pond. Very large ones are found to be comparatively much less productive. The decoy-pond ought to be surrounded with trees and copse; reeds and sedges being permitted to flourish near the water, &c. Several pipes are led off from the pond, in different directions, ditches of six or eight inches in depth, of a curved form, and becoming narrower towards the extremity. It is in these pipes that the wild-fowl are caught, particularly mallards, teal, and widgeons, and often in very great numbers. The length of the pipe is generally from sixty to eighty yards, its breadth at the mouth from twenty to thirty feet, diminishing to two feet at the extremity, where it terminates in a tunnel-net, generally carried out on the dry land. The whole pipe is spanned with a light netting, spread upon semi-circular bars of iron rod, in an arch of about twelve feet above the water at the entrance, but becoming lower as the pipe becomes more narrow. To attract wild-fowl to the pond, and to induce them to enter the pipe, decoy-ducks are kept, constant inhabitants of the pond, and regularly fed. Wild-fowl come more readily to the pond because of their presence, and follow them also to the mouth of the pipe, and into it, when they come at the well-known whistle of the decoy-man, to feed on the grain which he scatters for them on the water. It is only thus that the decoy-ducks are of use. They are not trained in any way, nor do they display any intelligence beyond response to the whistle which invites them to their food. Very different is the case with the decoyer's dog, the piper, so called not from any vocal powers, but from his use in enticing birds into the pipe. The dogs best adapted for this purpose are a peculiar breed, small, fox-like, and very lively and frolicsome. They are very carefully trained, and their peculiar qualities seem to be in some measure hereditary. On the convex side of the curve of the pipe, for about thirty or forty yards, instead of netting coming down to the ground, screens made of reeds are placed of height sufficient to conceal the decoyer; but they are placed obliquely, with narrow outlets between them through which his dog may pass, and with bars in the intervals about 18 inches high, for the dog to leap over. When the wild-fowl have been attracted to the mouth of the decoy, and the decoyer, peeping through the screens, perceives that they are in the proper situation, he sends out the dog, which makes sportive gambols in their sight, and they are attracted by the strange object, as sheep are when a small dog plays about in the field where they graze. They enter the pipe in pursuit, as if for gratification of their curiosity, and the dog leaps over the first leaping-bar, and disappears behind the screens, where his master immediately rewards him with a piece of cheese or other delicacy. When the wild-fowl have advanced a little further, the dog is sent out again, repeats his gambols, leaps over the second leaping-bar, and gets a second piece of cheese. The curiosity of the birds seems to increase, and when they have proceeded far enough the man shows himself, whereupon a rush is made by the birds towards the far end, where they are captured. The dog is trained to keep perfect silence. A single bark would disperse the birds. The success of the decoyer depends very much on the state of the weather, and he must consider the direction of the wind in order to the choice of the pipe he is to use. Into such details, however, we cannot enter. It is in the daytime, and not by night, that wild-fowl are captured in the decoy. They generally leave the decoy-pond at night for neighboring feeding-grounds. The decoyer often finds it profitable not to attempt the capture of birds when they first appear on the pond, but to wait for a few days, when they congregate in greater numbers.

Decoys are of so great value that many acts of parliament have been passed for

their regulation and protection. A decoy which has been established for twenty years enjoys certain privileges secured by law, particularly as to the quietude of its vicinity, which must not be disturbed by the firing of guns at wild-fowl apparently going to the pond, even by the proprietors of land over which they pass.

Flight-ponds alone remain to be noticed. These are used chiefly for the capture of pochards or dun-birds, which very seldom enter the pipes of the decoy. The same pond is sometimes used both as a decoy-pond and a flight-pond. The pochard, having its legs placed far back, cannot rise from the water so suddenly as the wild duck or widgeon, and skims the surface for many yards, proceeding by a very gradual ascent. To capture flights of pochards, nets are used, which are fixed to a cumbersome apparatus of poles at the side of the pond. The pond may be about seventy or eighty yards square. On an embankment, about ten yards from the water, strong posts are fixed, about twelve feet high, two together, and about fifty yards apart—the corners of the pond being generally occupied by trees. Further back about fifty feet are slighter posts, about fifteen feet high. Other posts are required for the working of the net, the position and use of which we cannot explain; but the purpose of the whole is that the net, which is of the form of a parallelogram, may be suddenly thrown up into the air. In order to this, it is attached to cross-bars, which work between the twin posts and heavily-weighted boxes attached to two poles, aid in bringing it into an erect position when required. The fowler's skill relates very much to the moment of raising his net, which he does by drawing a bolt or trigger. The net ought to rise so as fully to confront the birds as they issue from the pond. Pens are formed on the embankment in front of the net of red screens about three feet high, by two or three feet square, and the birds falling into them on being thrown back from the net, are caught, not being able to rise again. The number of pochards caught at once is sometimes very great. For full particulars concerning wild-fowling, the reader is referred to Col. Hawker's well-known work on "Shooting," and to "The Wild-fowler," by Folkard.—An Act was passed in July 1876, *For the Preservation of Wild-fowl*, making it punishable by fine to kill them, or to use any instrument for that object, during the breeding season—15th February to 10th July.

Folkard, in his excellent work upon Wild-fowling, remarks that writers upon sporting literature generally apply correct terms to game and birds of the land, while water-fowl are invariably classed by them as "flocks." The modern terms as applied to water-fowl, are, according to Folkard, as follows: "A herd of swans. A gaggle of geese (when on the water). A skein of geese (when on wing). A paddling of ducks (when on the water). A team of wild ducks (when flying in the air). A sord or suit of mallards. A company of widgeon. A flight or rush of dunbirds. A spring of teal. A dopping of sheldrakes. A covert of coots. A herd of curlews. A redge of herons. A wing or congregation of plovers. A desert of lapwings. A walk of snipes. A fling of oxbirds. A hill of ruffs. A small number of wild-fowl, as ducks and geese (about thirty or forty), is termed a "trip." The same of widgeon, dunbirds, or teal, is termed a "bauch;" and a smaller number (from ten to twenty) is called a "little knob." Of swans, it would be said, a "small herd;" and sometimes of geese, a "little guggle," or a "small skein;" and so of ducks, a "short" or "long team."

WILD HUNT (Ger. *Wilde* or *wüthende Jagd*; also *Wildes* or *wüthendes Heer*, Wild or Madding host; *Nachtjäger*, Night Huntsman, &c.), the name given by the German people to a fancied noise sometimes heard in the air at night, as of a host of spirits rushing along over woods, fields, and villages, accompanied by the shouting of husmen and the baying of dogs. The stories of the Wild Huntsman are numerous and widespread: although varying in detail, they are uniform in the essential traits, and betray numerous connections with the myths of the ancient gods and heroes. The root of the whole notion is mostly easily discernible in the expression still used by the peasants of Lower Germany when they hear a howling in the air, "Wode hunts" (*Wode jaget*), that is, Wodan or Odin marches, as of old, at the head of his battle-maidens, the Walkyries, and of the heroes of Walhalla; perhaps, too, accompanied by his wolves, which, according to the myth, along with his ravens, followed him, taking delight in strife and poncing upon the bodies of the fallen. The heathen gods were not entirely dislodged from the imagination of the people

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by Christianity, but they were banished from all friendly communication with men, and were degraded to ghosts and devils. Yet some of the divine features are still distinctly recognisable. As the celestial god Wodan, the lord of all atmospheric and weather phenomena, and consequently of storms, was conceived as mounted on horseback, clad with a broad-rimmed hat shading the face, and a wide dark cloak; the Wild Huntsman also appears on horseback, in hat and cloak, and is accompanied by a train of spirits, though of a different stamp—by the ghosts of drunkards, suicides, and other malefactors, who are often without heads, or otherwise shockingly mutilated. One constant trait of the stories shows how effectually the church had succeeded in giving a hellish character to this ghost of Wodan—when he comes to a cross road, he falls, and gets up on the other side. On very rare occasions, the Wild Huntsman shows kindness to the wanderer whom he meets; but generally he brings hurt or destruction, especially to any one rash enough to address him, or join in the hunting cry, which there are many narratives of persons in their cups having done. Whoever remains standing in the middle of the highway, or steps aside into a tilled field, or throws himself in silence on the earth, escapes the danger. In many districts, heroes of the older or of the more modern legends take the place of Odin; thus, in Lusatia and Orlagan, Berndttrich, that is, Dietrich of Bern; in Lower Hesse, Charles the Great; in England, King Arthur; in Denmark, King Waldemar. The legend has also in recent times attached itself to individual sportsmen, who, as a punishment for their immoderate addiction to sport, or for the cruelty they were guilty of in pursuing it, or for hunting on Sunday, were believed to have been condemned henceforth to follow the chase by night. In Lower Germany, there are many such stories current of one Hakkelberend, whose tomb even is shown in several places. Still, the very name leads back to the myth of Wodan, for Hakkelberend means literally the mantle-bearer (from O. H. Ger. *hakkul*; O. Norse, *hakkul* or *hokla*; Ang.-Sax. *hacelo*, drapery, mantle, armor; and *bera*, to bear). The appearing of the Wild Hunter is not fixed to any particular season, but it occurs frequently and most regularly in the twelve days between Christmas and Epiphany.

Another version of the Wild Hunt is to be found in the legend prevalent in Thuringia and the district of Mansfeld. There the procession, formed partly of children who had died unbaptised, and headed by Fran Holle or Holda (see *BEBOHRA*), passed yearly through the country on Holy Thursday, and the assembled people waited its arrival, as if a mighty king were approaching. An old man, with white hair, the faithful Eckhart (see *TANNAUSER* and *VENUSBERG*), preceded the spirit-host, to warn the people out of the way, and even ordered some to go home, so that they might not come to hurt. This is the benign goddess, the wife of Wodan, who, appearing under various names, travels about through the country during the sacred time of the year. This host of Holda, or Berchta, also prefers the season about Epiphany. In one form or other, the legend of the Wild Hunt is spread over all German countries, and is found also in France, and even in Spain. In Lower Germany, it has been preserved in an older and purer form than in Upper Germany. It has probably some connection with Celtic mythology, but not apparently with the Slavonic.—See Grimm, "*Deutsche Mythologie*."

WILFRID, Saint, an Anglo-Saxon bishop, was born of noble parents, in the kingdom of Bernicia in 634. He was remarkable when a boy for his good looks, graceful manners and ability. He became at 14 the attendant on a Saxon nobleman, who had retired to spend the last years of his life in the monastery of Lindisfarne. There his attention was directed to the controversy as to the time of celebrating Easter (q. v.), existing between the two sections into which the Anglo-Saxon Christians were divided; the one advocating the Roman practice, which was that of the continental churches generally, the other adhering to the Scotch-British. W. resolved to visit Rome to ascertain which was in the right, and thither he went at the age of 19, with recommendations from the courts of Kent and Bernicia. He returned to England a warm partisan of the Roman party. From Alfrid, king of Northumbria, he received a grant of land and a monastery at Ripon, and there, in 664, he was ordained a priest. The synod of Whitby, which met in 664, to discuss the disputed questions between the two parties in the church, was attended by the most distinguished members of both, and among others, by Colman, Bishop of Lindisfarne, and Wilfrid. We have a curious account of this conference. The king

presided, and seems at first to have been puzzled by the arguments, but he noticed that Colman always referred to St Columba, W. to St Peter—and it struck him that the relative power of these saints had a close connection with the points at issue. "St Peter," said W., "is the rock on which the Lord founded his church, and to him he intrusted the keys of heaven." "Did St Columba not receive the same power?" asked the king. Colman could not say he had. "Then you both admit that God has given the keys to St Peter?" Both said they did. "Well," continued the king, "if it is so, I shall not oppose him. Were I to do otherwise I might find no one to open the gates when I came there; St Peter might turn his back on me. We must not offend him." The council and audience were carried away by this argument, and the king decided in favor of the Roman party. W. was afterwards named Bishop of York, but he did not enter into possession of his see until 689. He then surrounded himself with great pomp, built churches, one of which, at Hexham, was said to be the finest north of the Alps, and strove to oppose the ecclesiastical to the royal power. A quarrel followed with the new king of Northumbria, named Egfrid, and W. was deposed. He started on a journey to Rome, to make a personal appeal to the pope; but he was driven by a storm to the coast of Frieland, the inhabitants of which were still pagan. There, however, he was hospitably received by the king. To his arrival, the people attributed an excellent fishing season and abundant harvest. He was asked to preach, and he did so in his own Anglo-Saxon tongue, which was perfectly intelligible to the Frisians. Such was the effect, that he baptised many thousands of the people, and all the princes. The event is one of the most memorable in the history of Northern Germany and Scandinavia, for with it began the conversion of these countries to Christianity by Anglo-Saxon missionaries, and the introduction into them of the arts and knowledge inherited from ancient civilisation (see BONIFACE; WILLIBROD). W. reached Rome, and the pope decided in his favor; but on his return to England, the king gave no heed to the decree, and committed him to prison. He escaped, however, to the Weald of Sussex, where he converted the pagan inhabitants. He was afterwards recalled to his see; and a proposal was made to elevate him to the primacy, but he was still opposed, as the leader of the Roman party, and ultimately he was deposed, and excommunicated. He again went to Rome, remained there some years, returned to England in 706, and died at Onnle, in Northamptonshire, in 709.—There is a very interesting sketch of the saint's life in the 19th chapter of Bodley's "Ecclesiastical History." See also Lappenberg's "History of England under the Anglo-Saxons."

WILHELMSHÖHE. See CASSEL.

WILKES, Charles, American naval officer and explorer, was born in New York in 1801, and entered the navy as midshipman in 1816, served in the Mediterranean in 1819–1820, and in the Pacific in 1821–1823, where he was selected for a separate command. In 1826 he gained the rank of lieutenant, and in 1830 was appointed to the Depot of Charts and Instruments at Washington, and was the first in the United States to set up fixed astronomical instruments and make observations. After being employed in surveying George's Bank, he was in 1838, appointed to the command of an exploring expedition of five vessels and a storeship, in which he surveyed the Samoan group in the Pacific, discovered many islands and the antarctic continent, which he coasted through 70° of longitude, explored the Fiji group. In 1842, he was made a commander, and published a "Narrative of the United States Exploring Expedition" (5 vols. 1845) for which he received the gold medal of the Royal Geographical Society. Of the 11 supplementary vols., he was the author of the one on Meteorology; and in 1849, of a volume on California and Oregon, entitled "Western America." In 1856 he published his "Theory of the Winds." Having been promoted to the rank of captain in 1855, he, in 1861, took command of the United States steamer *San Jacinto*, and forcibly removed from the British mail-steamer, *Trent*, Messrs Mason and Sildell, commissioners of the Confederate States to England and France, and conveyed them to Boston, receiving the thanks of Congress and the acclamations of the people; but at the demand of the British government, his act was disapproved, and the commissioners restored. In 1863, he was promoted to the rank of commodore, and in 1868

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commanded a squadron in the West Indies. In 1866 he was commissioned as rear-admiral on the retired list.

WILKES, John, a celebrated public character, was born in London, October 17, 1877. His father, a brewer or distiller at Clerkenwell, sent him when a lad to the university of Leyden, where he received an excellent education. On his return to England in 1749, he married a Miss Mead, an heiress, ten years his senior. His good manners, learning, ready wit, and open table secured him many friends, but extravagance and dissipation soon involved him in difficulties. He and his wife separated, and in a lawsuit which followed, facts came out most damaging to his character. He was nevertheless named High Sheriff of Buckinghamshire, and in 1757 returned to parliament as member for Aylesbury. In the House, he joined in the popular clamor against Lord Bute; and in June 1762, founded a paper entitled the "North Briton," in which he denounced him with such vigor and success as to drive him from the ministry. He attacked with equal bitterness the next ministry, insinuating that although Mr Greville was nominally at the head of affairs, Lord Bute still had the ear of the king. In the 45th number of the "North Briton," he charged the king with having uttered a falsehood from the throne, and in consequence, his house was entered, and his papers were seized. He was himself committed to the Tower, on a general warrant. But he was released by Chief-justice Pratt, on account of his privilege as a member of Parliament. His paper was burned, by order of the House of Commons; but a riot ensued, shewing that public sympathy went with Wilkes. A prosecution was next instituted against the Under-secretary of State by W. for the illegal seizure of his papers; and he obtained £1000 of damages—a declaration being at the same time made by the Chief-justice that general warrants are illegal. W. then went to France, on the plea of bad health, and was expelled from the House of Commons. In his absence, he was convicted of having printed privately an obscene poem, of which he was one of the authors. It was hoped that evidence of his immoral character would disgust the public with him. But the copy of the book on which the prosecution had been founded had been obtained surreptitiously from a printer employed; and this fact becoming known, the steps taken by the government, instead of injuring W., only added to the outcry against ministers. On the formation of a new ministry under the Duke of Grafton, W. returned to England, and becoming a candidate for Middlesex, harangued great crowds in London. After his election, he was arrested, in consequence of his outlawry; and on the way to prison he was rescued by a mob. He, however, after it had dispersed, voluntarily gave himself up to justice. When parliament met, a crowd assembled to convoy him to the House of Commons. A riot took place, and the military were ordered to fire on the mob in St George's Fields. Many persons were wounded, and one was killed. The coroner's jury who sat on the body returned a verdict of murder against the magistrate who had given the order to fire; and he was tried for that crime, but acquitted. W. secured a copy of a letter from Lord Weymouth to the chairman of the Lambeth Quarter Sessions, in which it was recommended that the military should be employed to suppress disturbances in London. It was published with a preface by W., in which he charged the Secretary of State with having planned "the massacre in St George's Fields." The House declared the preface to contain a seditious libel, and W. was again expelled. He was after this re-elected several times as member for Middlesex; but the elections were declared void. Colonel Luttrell, who vacated his seat and opposed him, obtained only 800 votes; but he was declared to be duly elected, in defiance of a protest from the whole country. W., still in prison, was now recognised as the champion of public liberty, and became the most popular man in England. In 1769, he obtained a verdict against Lord Halifax in the Court of Common Pleas, with £4000 damages. He was shortly after discharged from prison on giving a bond for good behavior during seven years. In 1774, he was chosen Lord Mayor of London, and again returned for Middlesex, which he continued to represent for many years. In 1783, the resolution by which he had been declared incapable of re-election was expunged from the minutes of the House of Commons, as subversive of constitutional rights. The other resolutions relating to W. were at the same time expunged. Two years later, he withdrew from the House of Commons. He died 37th of December 1797.

WILKIE, Sir David, a distinguished Scottish painter, was born in Fifeshire, at Cults, of which parish his father was minister, 18th November 1785. His boyish passion for art was too strong to be resisted by his father, who, with much reluctance, sent him, in 1799, to study in the Academy at Edinburgh. Here he greatly distinguished himself; and returning home, in 1804, he painted his "Pittlesie Fair," a piece in which already his peculiar genius is pronounced, and which brought him the sum of £25. The price seems paltry; but for the work of an unknown country stripling in an original walk of art, it was perhaps to be considered handsome. Shortly after, W. proceeded to London, intending to return to Scotland after a year or two of study; but the great success of his picture, "The Village Politicians," determined him to settle in the metropolis. Not that, peculiarly, he was very greatly benefited, £30 being all that the Earl of Mansfield could with difficulty be got to pay for the picture, though aware that, on a point of honorable scruple, the artist had refused repeated offers of £100; but the originality and humor of the work greatly captivated the public, and at once established the reputation of the painter, who had soon commissions in plenty, at greatly advanced prices. In 1809, his brethren of the Royal Academy ratified the favorable verdict of the public by electing him an Associate; and two years afterwards, he was advanced to the rank of Academician. In 1814, in company with his friend Haydon, he visited Paris, and inspected with great delight the art-treasures at the Louvre. Though his father had died some years before, and his mother and sister were now living with him at Kensington, in 1817 he made a run into Scotland, and while the guest of Scott at Abbotsford, painted his well-known picture of the great poet and his family. During these years, W. had been engaged on the series of pictures on which mainly his fame rests; pictures familiar by engraving to every one the ("Blind Fiddler," "Card Players," "Rent Day," "Jew's Harp," "Village Festival," "Blind Man's Buff," "Distraining for Kent," "The Penny Wedding," "Reading of the Will," &c.), in which the homely humors of humble life are expressed by a vehicle appropriately simple, and—though scarce in the higher sense to be called color—of charming purity and transparency. In this style, distinctively his own, his genius is commonly held to have culminated in "The Chelsea Pensioners listening to the News of Waterloo," which was painted during the years 1820—1821. This work was a commission from the Duke of Wellington, who paid the artist 1200 guineas for it. Subsequently, he changed his style, sought to emulate the depth and richness of coloring of the old masters, and deserting the homely life, which he could treat so exquisitely, chose elevated, and even heroic subjects, to the height of which he could never rightly raise himself. The florid picture, painted in 1830, of "George IV. entering Holyrood," which, though not without its fine points, can delight no one but a flunkey, gave the first hint of the change; and no doubt a tour over nearly the whole continent, which he made for his health, in 1824, everywhere, of course, intent upon the grand old masterpieces, did something to stimulate the new and unwise ambition. By common consent, it has been adjudged unwise; and W. remains, and will remain, memorable, not for the quasi-high art of his later years, but for the simpler, truer, and, in every right sense, higher art of his earlier time. He never, however, ceased to be popular, and honors continued to be showered upon him. On the death of Sir Henry Raeburn, he succeeded him as Limner to his Majesty; in 1830, he was made Painter in Ordinary to his Majesty, in room of Sir Thomas Lawrence deceased; and in 1836, the honor of knighthood was conferred upon him. W. had never been robust, and his health now began to give way seriously. In 1840, seeking to re-establish it, he once more left England; but he did not find what he sought. Having visited Syria, Palestine, and Egypt, he died on his voyage home, off Gibraltar, and his body was committed to the deep.

As an illustrator of Scottish character and manners in humble life, W., in his best pictures, may take rank with Burns in poetry, and Scott in fiction. As a man, he was kindly, warm-hearted, and of essential generosity of disposition. See "Life and Letters of W." by Allan Cunningham (1843).

WILKINSON, Sir John Gardner, a distinguished traveller and archaeologist, was the son of the late Rev. John Wilkinson, of Hardendale, in Westmoreland, and was born on the 5th of October 1797. Having lost both his parents at an early age, he was left under the guardianship of the Rev. Dr Yates, by whom he was sent to

Harrow School in 1813, and to Exeter College, Oxford, three years later. While a boy, young W. had a strong desire to enter the navy, principally with a view to seeing foreign countries. He also in early life shewed a great fondness for architecture and sculpture. While at Harrow, he made sketches of all the churches within a radius of some miles from the school; and while at Oxford, often employed himself in drawing from the objects contained in the Arundel Collection. He still further cultivated his taste for architectural antiquities by trips on the continent made during his college vacations. On taking his B.A. degree, he resolved upon making a wider tour on the continent. While in Italy, he became acquainted with Sir W. Gell, who, perceiving his taste for archaeological research, strongly urged him to make an extensive survey of the remains of Egyptian civilisation; and in October 1821, he set out for Alexandria, as a starting-point for his explorations. He took up his abode at Cairo, where he learned Arabic, both to read and speak; he also studied Coptic. Making Cairo his head-quarters, he now travelled through and investigated almost every part of Egypt and Lower Nubia. Twice he ascended the Nile as far as the Second Cataract, and several times as far as Thebes. At the latter famous site, he spent more than 12 months in making explorations; he also visited the deserts on either side of the river, and the Egyptian oases. During subsequent visits, he completed the exploration of those deserts, and, in fact, made a complete survey of Egypt, on a scale of about ten inches to a degree, which, unfortunately, for the interests of science, has not yet been published. The same might have been the case with his "Survey of Thebes," had not the author engraved and published it at his own expense. As a result of his first visit to Egypt, W. transmitted to the British Museum more than 300 antiquarian objects, besides numerous specimens of natural history. W.'s first residence in Egypt extended over a period of twelve years, during which time he composed and published his first two works on Egyptian subjects—viz., "*Materia Hieroglyphica*," containing the Egyptian Pantheon and the succession of the Pharaohs, from the Earliest Times to the Conquest by Alexander, and other Hieroglyphical Subjects: with Plates and Notes explanatory of the same." The preface to this work is dated "Pyramids of Geezeh, July 1823;" but it was printed and revised for the author at Malta in the same year. This work was followed by "Extracts from several Hieroglyphical Subjects found at Thebes and other parts of Egypt, with Remarks on the same"—also printed at Malta in 1830, but with a dedication to Sir W. Gell, dated "Thebes, 1827." In the same year (1830), he published his "*Topographical Survey of Thebes, Topé, Thaba, or Diospolis Magna*," in six sheets. In 1833, W., in consequence of ill-health, was obliged to return to England. In 1835, he published "*Topography of Thebes, and General View of Egypt*" (Lond. John Murray). This was followed in 1837 by "*Manners and Customs of the Ancient Egyptians, including their Private Life, Government, Laws, Arts, Manufactures, Religion, and Early History*;" derived from a Comparison of the Paintings, Sculptures, and Monuments still existing with the Accounts of Ancient Authors: illustrated by Drawings of those subjects" (3 vols., Lond. John Murray). This work at once obtained great popularity, both from the extent and soundness of its information, and the agreeable style in which it was written. It was highly spoken of by the critics; and obtained for him also the honor of knighthood, with which he was invested in 1839. Many things of importance were, however, omitted in it, which he afterwards published in "*A Second Series of the Manners and Customs of the Ancient Egyptians, including their Religion, Agriculture, &c.*" (3 vols. and a volume of plates, Lond. Murray, 1841). W. again visited Egypt in 1841 and in 1843. He also visited Syria, Constantinople, Tunis, and Sicily, returning to England after an absence of two years, by the Illyrian coast of the Adriatic. During his two years' absence, he also visited Dalmatia and Montenegro, which gave occasion to the publication of his "*Dalmatia and Montenegro, with a Journey to Mostar, in Herzegovina, and Remarks on the Slavonic Nations; the History of Dalmatia and Ragusa; the Uscoks, &c.*" (3 vols., Lond. Murray). W.'s other works are—"Modern Egypt and Thebes; being a Description of Egypt, including the Information required for Travellers in that Country;" with Wood-cuts and a Map (3 vols., Lond. Murray, 1843); "*Handbook for Travellers in Egypt*;" new edition condensed of modern Egypt and Thebes (Lond. 1847, and again in 1859); "*The Architecture of Ancient Egypt*," with a large volume of plates illustrative of the subject (Lond. 1850); "*The Fragments of the*

Hieratic Papyrus at Turin, containing the Names of Egyptian Kings, with the Hieratic Inscription at the Back" (Lond. 1851); "A Popular Account of the Ancient Egyptians," revised and abridged from his larger Work (Lond. 1854); "The Egyptians in the Time of the Pharaohs;" to which is added an "Introduction to the Study of Egyptian Hieroglyphs," by S. Birch (Lond. 1857), published as a companion to the Crystal Palace guides; "On Color, and on the Necessity for a General Diffusion of Taste among all Classes; with Remarks on laying out Geometrical Gardens;" illustrated by Colored Plates (Lond. 1858). W. also contributed notes to the Rev. G. Rawlinson's edition of "Herodotus." In 1848, he paid a fourth visit to Egypt, and a fifth in 1855, when, as he was drawing at Thebes under excessive heat, he received a *coup de soleil*, which compelled him to return home. There W. occupied himself in examining ancient British remains in England and Wales. In 1874, he presented to the governors of Harrow School his collection of coins, about 1000 in number, having previously given to the same body his large collection of Egyptian, Greek, and other antiquities, for the purpose of founding a museum at the school. His death took place in 1875.

WILL is, in English Law, a writing by which a person entitled to property declares what is to be done with such property after his death. Though, by the Wills Act, 1 Vict. c. 26, a writing is indispensable to a will, yet there is an exception in the case of soldiers or sailors who, from their occupation, and while in actual service, are allowed to make a verbal or nuncupative will; and this exception only extends to their personal estate, for they must make a written will, like other persons, in order to deal with their real estate. An infant, or person under 21 years of age, cannot, since 1838, make a will. A married woman can only make a will if she has separate property, or her husband assents to her will, or she makes the will by virtue of some power of appointment vested in her. As a general rule it is absolutely necessary that the party making a will should have a free and disposing mind at the time; and hence, if he or she is a lunatic, or drunk, or acting under compulsion, fear, or undue influence, the will is invalid. There is no limit as to the time preceding death when a will may be made; it is enough that the testator was at the time capable and sensible, though he died immediately after. A will must be executed in presence of two witnesses, who see the testator sign the will, or at least hear him acknowledge it. But there is no particular form of words in which a will must be made for the purpose of disposing either of realty or personalty. The will must be in writing, but it need not be in ink or written continuously. The testator may sign by his mark or by an assumed name. Though a seal is not equivalent to a signature, yet a person may have a stamp to sign papers with, and that will be sufficient for a will also. The testator need not sign the will if he authorise some one to do so for him in his presence. The signature must be at the foot or end of the will; but if it is placed so as to lead a court to the conclusion that it was intended to give effect to the will, that will be enough. Though the witnesses need not know it is a will, they must be present together when the testator signs it or acknowledges his signature. The witnesses must sign their names or make their marks. A legatee, or the wife or husband of a legatee, may be an attesting witness, but by being so, he or she will forfeit any legacy left to him or her by the will. But one may be an executor though he attests the will. A will is revoked by the marriage of the testator or testatrix. The mere fact of making a subsequent will does not of itself operate to revoke a prior will, unless there is some inconsistency in whole or in part; and as a general rule, no will will be revoked by any presumption of an intention on the ground of an alteration in circumstances. The usual way of revoking a will is to burn, tear, or destroy it with the intention of revoking the same; or by executing another will which expressly revokes the prior will. When a testator tears or cuts away that portion of his will containing the signature and attestations, the presumption is that he intended to revoke the whole. But merely cutting out a part of the will, or striking it through with a pen, does not amount to a revocation. It is to be borne in mind that, in order to revoke by tearing, &c., there must be an intention to revoke, so that a mere accidental tearing will prevent the act from having the force of revocation. When there are interlineations or alterations in a will, it is presumed these are made after signature, unless there is evidence to prove the contrary. A will which is in any manner revoked can only be revived by

re-execution, or by a codicil shewing an intention to revive it: but many nice questions have arisen as to what causes a will to revive—in Scotland, a will is used only to denote a testament affecting personal or movable property; while a will affecting real or heritable property can only be made by way of a deed having a present operation. A will or testament may be written in the handwriting of the testator, and if signed by him will not require witnesses, being then called a holograph will. In other respects, wills are subject to nearly the same rules which prevail in England with respect to revocation, &c. Wills of real property are called Dispositions or Deeds, and have a present operation, and the mode in which they are drawn up is that of conveying the property to the donee, but reserving the testator's life-tenure. The effect of this is that the testator retains the property in his own hands while he lives; but the moment he dies the disposition *mortis causa* comes into play, and the donee then takes the property, subject to the deed. See DEED.

WILL. The mind is divided into three distinct functions—Feeling (see EMOTION), Intellect or Thought (see INTELLECT), and Will or Volition. Under Will is included the putting forth of active energy to move our own organs, or change something about us: but all energy is not voluntary energy. The peculiarity of action from Will, in contrast to other activities, as the powers of nature—wind, gravity, &c., is its being preceded or inspired by feelings, or by the pleasures and pains of an individual mind. Hence, Will is defined, *action prompted by feeling*. The feelings that prompt the will, called motives, are our pleasures and our pains; pleasure felt or imagined moves us to continue and increase the pleasurable state; pain urges us to work for the abatement of the pained condition.

In the maturity of the powers, a human being or animal can perform a great variety of specific actions at the bidding of the various wants or desires. The sensation of thirst induces at once a series of complicated movements, ending in the relief of the painful feeling. But no man or animal is born with the ability to make a journey to a well, whenever thirst is felt; the human infant cannot even perform the voluntary act of lifting anything to its mouth. Our most ordinary voluntary movements are the result of an education; and the explanation of the volitional energies consists in ascertaining what are their beginnings or germs in the mental constitution, and how they are brought to the finished state.

Three different facts of our nature appear to concur in forming the collective aptitudes of the Will.

I. The fact termed Spontaneous Activity, or the self-acting energy of the system, whereby movements arise without waiting the stimulus of the senses. Any actively disposed animal, after rest and nourishment, begins to move merely through a surplus of nervous power, and not because it is wakened out of dormancy by the solicitations of sensible objects. Without this tendency to commence movements in the first instance, there would be no apparent basis for the voluntary acquisitions. See SPONTANEITY. In imitation with the voice, for example, we must begin by uttering sounds, and then discover by the ear their agreement or disagreement with the sounds heard.

II. The second fact is the tendency to abide by a movement giving pleasure, and to relax a movement coincident with pain. From the first moments of sentient life, every animal appears to possess this property. If a movement happens to coincide with an access of pleasurable warmth, the animal maintains, and possibly increases, the movement; if the warmth passes into pain, the movement ceases. The infant sucks so long as the feeling is pleasurable, and ceases when satiety comes on. This power may be an offshoot of the general law connecting pleasure with an increase, and pain with a diminution of vital energy. See EMOTION. However arising, the fact is unquestionable, and is exemplified all through life. Without our going through any process of deliberation or resolution, we sustain an activity that brings us agreeable sensation, and remit an activity ending in pain. We keep our eyes fixed on a cheerful flame, and withdraw them when the glare is overpowering: the process is self-acting and intuitive.

III. The third fact is the operation of the Retentive power of the mind, in joining together, by a permanent association, movements and feelings that have existed together for some time. This is a branch of the great law of Contiguous Association.

See ASSOCIATION OF IDEAS. The Will is an educated function, and education supposes the plastic or fixing operation expressed by the above-named law.

But the chief nicety in explaining the growth of the Will consists in shewing how the proper movements and feelings originally came together. This is the problem of the Development of Voluntary Power, which would demand an extended illustration. A brief indication of the process must suffice.

One of the earliest examples is the moving of the head to follow a light or other object pleasing to the gaze. This power is not possessed at the commencement of life, and the process of arriving at it is supposed to be as follows: The child has its eyes fixed on the light, and enjoys the luminous excitement. The light is moved to one side, and is therefore lost to the direct gaze, and there is no power to recover it. An accidental movement of the head, occurring by mere spontaneity, carries the eyes round to encounter the light again, or to follow it as it moves; the consequence is, that the recovered pleasure of the spectacle sustains the movement that brings it. Now, every such coincidence tends to become fixed, by the law of plastic association; and after a few repetitions of the accidental concurrence, there is a connection formed between the optical impression and the movement that is found to go along with and sustain it. Thus it is, that a movement of the object to the right hand, which leaves a characteristic trace on the visual organ, becomes associated with a movement of the eyes and the head to the right hand; and whenever the optical fact arises, the movement is apt to follow. This makes one distinct item in our volitional acquisitions; one instance of the power of definitely acting to a definite feeling.

Another example might be taken from the feelings of warmth and chillness—both very powerful sensations in all animals. One of the most obvious means of attaining comfortable warmth is to crouch and bring all the limbs close to the body. A very early experience would connect this posture, accidentally hit upon, with the comfortable sensation; and, by virtue of the primary law of the mind, connecting pleasure with exalted energy, the movement, once coinciding with the pleasure, would be sustained and adhered to, so long as it brought the pleasure; and in course of a few repetitions, a definite association would be formed between the state of chillness and this mode of relieving it. By a more lengthened and round-about process, more complicated associations would be formed, such as coming close to the warm body of a companion, running into shelter, approaching a fire, going into the sunshine, &c.; but, in all cases, the only mode of attainment that can be pointed out, is (1) the concurrence of spontaneous movements with feelings of pleasure, or relief from pain; (2) the maintenance of those movements by the first law of self-conservation; and (3) the forming of a link between the two by the force of plastic association.

The illustration may be varied by viewing the case from the side of pain. The immediate and direct result of pain, from the dawn of sentient life, is to lower active energy for the time, and therefore to arrest whatever movements are in progress: this is the general rule, although there is an important exception in the case of acute or pungent pain, which, in the first stage, stimulate and excite the active members. Hence, when a movement happens to coincide with a pain, it is liable to be arrested; a blister morsel in the month makes one cease chewing, by reducing the active power for the moment. The primitive endowment of the system would lead to nothing further, until some chance movement of the month tended to get rid of it, which movement would be promoted and sustained by the pleasurable feeling of relief, which is the operation of the principle from the other side.

The growth of the Will is conspicuously shewn in Imitation, which is an acquired aptitude, and a department of our voluntary power. In imitation, there must be (1) a spontaneous tendency to move the active organs concerned—the voice, the month, the hands, &c.; (2) a sense of the effect, with a certain pleasure in attaining it; and (3) a cementing process, as already described. In learning to speak, the infant must first articulate something of its own accord; the resulting sound affects its own ear, and is discovered to coincide with a sound heard from others. The frequent repetition of the articulate effort leads to its being coupled in the mind with the sound that it gives; and when this association is mature, the sound heard will induce the articulating movement; and this is the power of imitation. But previous to the opportunity of associating the exertion of the month, throat, and lungs

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with the sound emitted, there does not appear to be any capability to imitate articulate sounds. The same would apply to imitation by the hands.

The Will in its full development includes not merely a series of associations of movements with the ordinary pleasures and pains, but also the power of performing actions to the word of Command, the Imitative faculty just discussed, and the power of acting from a mere Wish to perform a certain action, or to produce a certain effect upon things about us—as to open a window or stir the fire. It might be shewn that all these various aptitudes grow, by successive stages, out of the three fundamental facts above described. The process involves many struggles and failures, from there being so much in it depending on accidental commencement; hence one reason of the slowness of the early education of human beings.—See Bain on "The Emotions and the Will." See also FREE-WILL.

WILLEMS, Jan Franz, a distinguished Flemish philologist and writer, and noted as one of the originators of the great Flemish national movement, was born, in 1798, at the little village of Bouchout, near Antwerp. W., at the age of twelve, was sent to the town of Lierre, to learn singing and music, for which he had early evinced considerable aptitude. At Lierre, which continued to be the seat of some of those ancient Belgian literary associations known as "*Rôderyk-Kamers*," or Chambers of Rhetoric, mysteries and other scenic representations were given from time to time in connection with these institutions; and during W.'s residence in the town he was frequently called upon to take part in these singular entertainments, a circumstance to which he ascribed his first impulse towards the study and cultivation of the old Flemish language and literature. The talents which he exhibited in his acting, and in the composition of satirical verses, attracted the notice of several influential persons at Lierre, through whose agency he was sent to Antwerp, to study in the office of a notary; and in 1811, he contended successfully for the prize awarded for the best poem on the battle of Friedland and the peace of Tilsit. From this period, his poetical and dramatic compositions followed each other in rapid succession. His ode "*Aen de Belgen*" (To the Belgians, which appeared in 1818, in which he exhorted his countrymen to resume the use of their native Flemish, and his clever treatise on "*De Nederduytsche Tael en Letterkunde*" (1819—1824), in which he traced the history of the Flemish and Dutch tongues from their common origin to their gradual but slight divergencies, marks an epoch in the literary history of Belgium. The Dutch government shewed their sense of his anti-French tendencies by giving him the post of Keeper of the Archives at Antwerp, while the Royal Institute at Amsterdam elected him a member of its learned corporation; but the Catholic party in Belgium resenting the attempt made by W. to refer the decline of Belgian national renown to the abandonment of the Flemish vernacular, looked upon his writings with mistrust; and in 1830 when Belgium was definitely separated from Holland, the dominant Belgian party deprived W. of his office, and left him for a time in obscurity and neglect. In 1835, chiefly through the influence of his old opponent, S. Van de Weyer, he was, however, promoted to the place of Keeper of the Archives at Ghent, where he continued to reside in the enjoyment of numerous literary successes and national honors, till the period of his death, which took place in 1846. W. had the satisfaction, during the latter years of his life, of seeing the gradual growth of the Flemish movement, which, since his death, has continued to advance with steady progress, and has resulted in the formation of many literary societies, the publication of numerous literary and historical remains of the old Flemish, and a more general cultivation of the vernacular. Among the numerous Flemish works published by W., special notice is due to his version of the mediæval poem of "*Iteuke Vos*," or "*Reynard the Fox*," for which he claims a Flemish origin; while, among the more important of his strictly national works, we may instance his editions of the rhymed chronicles of Jan de Klerk and Jan van Heelu, and his "*Mengelingen van Vaderlandschen Inhoud*."

WILLEMSTAD, a fortified town in North Brabant, on the Hollandediep, 19 miles north-west of Breda, erected by William I., Prince of Orange, to protect the traffic between Holland and Zealand. There are 7 bastions, 2 forts, 2 inundation sluices, and a good haven. Pop. (Jan 1, 1870) 1826. In 1793, Baron van Boetselaar successfully defended W. against the French, under Darnouriez, who, after a heavy

bombardment, were obliged to break up the siege. It was the birthplace of the naval hero, Callenberg, who, when De Ruyter fell in action with the French, succeeded to the command.

WILLESTADT, chief town of the island of Curaçao (q. v.).

WILLET (*Symphemia semipalmata*), a bird of the family *Scolopacidae*, a native both of North and South America. It is about fifteen inches long; dark ash-color above; the rump, upper tail coverts, and under parts white, the tail grayish, the tail-feathers, all except the two middle feathers, spotted with dark-grayish brown; the secondaries of the wings white, with dark-brown spots. The bill is two inches and a half in length, very thick, compressed; the wings long; the legs long and strong, the tail short and nearly square; the toes partially webbed. This bird is found in summer as far north as the coasts of New England; in winter, it retreats to the Gulf States. The flesh is highly esteemed, and the eggs are reckoned a delicacy. Willets are usually seen in flocks, and generally near the sea. The name is derived from the note.

WILLIAM I., king of England, commonly called *William the Conqueror*, was the illegitimate son of Robert surnamed *Le Diable*, Duke of Normandy. He was born in 1027, and succeeded to the dukedom on the death of his father in 1085. Previous to his father's death he had been intrusted to the care of Henry I. of France; but it was owing rather to the quarrels and jealousies of his own subjects than to the protection of Henry, that he was able to preserve his dominion intact until his arrival at manhood. In 1047 he gained a victory at Val de Dunes over a powerful competitor, Guido of Macon; and in 1064 he defeated another rival, Guillaume, Count of Arques, being aided in both contests by the French. His ambition now began to extend to England, where Edward the Confessor reigned at this time. On visiting England, W. found his hopes of succeeding Edward much strengthened by the dominance of Norman influence in the councils of that monarch. On Edward's death, however, the Witenagemote (q. v.) chose Harold (q. v.) to fill the English throne; ignoring, according to the monkish chroniclers of Norman bias, in so doing, an alleged bequest of Edward in favor of William. The Norman asserted his pretended rights by a powerful invasion, and the result was his acquisition of the crown by the famous battle of Hastings, October 14, 1066. Harold having been killed in the fight, the Saxons chose Edgar Atheling as his successor. Edgar was, however, soon obliged to yield, and W. was crowned king of England, December 25, 1066; from which day his reign is dated. Edgar remained for some time at his court, and his treatment of the conquered people was at first mild and conciliatory; but his savage suppression of a rebellion, which broke out in the north in 1070, laid the foundation of an irreconcilable antipathy between Saxon and Norman, which rendered a continuance of this policy impossible. Before long, W. began to rule like a true conqueror. Everywhere, the Saxons were reduced almost to a state of slavery. The higher classes were deprived of every office of church and state, while the people were ground down by new and oppressive taxes. Fortresses were erected over the country, and garrisoned, to overawe the Saxon inhabitants. In 1072, the Saxons were so far reduced to submission, that W. found time to lead an army across the border into Scotland, in order to punish the king of that country, Malcolm Canmore, for having received and protected Edgar Atheling. The Conqueror marched as far north as the Tay, and received a nominal submission from Malcolm. In 1085, an attempt was made to overturn the power of the English king by Canute, king of Denmark. A great naval armament was got together for the purpose of invasion, but the enterprise was abandoned, its abandonment being caused partly by bad luck, and partly, it is supposed, by a skillful application of W.'s treasure. The tax called the "*Danegelt*" (q. v.) was re-imposed to meet the expense caused by the threatened war. Disputes having arisen between W. and his son Robert respecting the duchy of Maine, which had come to W. through his marriage, November 2, 1083, with Matilda, daughter of Baldwin, 5th Earl of Flanders, father and son took up arms against one another. The dispute was ultimately adjusted, through the intercession of Queen Matilda. Most of the latter part of W.'s life was spent in Normandy, the government of England being intrusted mainly to his half-brother, Odo, Bishop of Bayeux. W. was of a corpulent habit of body, at which fact it seems that his brother monarch,

Philip I. of France, had pointed some sarcasm. W., in a fit of wrath, raised an army and invaded France. He took the city of Mantes, and set it on fire; but while in full enjoyment of the blaze, his horse, stumbling on some hot embers, threw him, and the injury he received proved fatal. He died September 9, 1037. Stern and ruthless as W. undoubtedly was, he yet knew how to govern a nation and protect it from foreign aggressions. For more than two centuries England had been harassed by the frequent descents of piratical hordes. He put an end to these. Never after W.'s time did a Norse rover venture to show face on the English coast. In the common administration of justice, he was royally impartial; many of his severities are even referrible in part to his thorough hatred of anarchy, while his attitude towards the church is admirable. He clearly defined the limits of ecclesiastical jurisdiction, and when the formidable Hildebrand desired that the Conqueror should do homage to him for the kingdom of England, the latter boldly refused.

WILLIAM II., king of England, surnamed *Rufus*, second son of William the Conqueror, was born in Normandy in 1056. He was educated by the celebrated Lanfranc, Archbishop of Canterbury. He was the favorite son of his father, who, on his deathbed, recommended him to the barons and prelates as his successor to the crown of England. William was, at the time of his father's death, along with him in Normandy. But no sooner had the event taken place than he set out for England. Landing at Dover, he obtained possession of its castle and of several other fortresses. He then presented himself to Lanfranc, who proposed him to the nobles and prelates as their king. No opposition was offered, and W. was crowned on September 26, 1037. Meanwhile, his elder brother, Robert, had entered upon possession of the duchy of Normandy. The relative position of the brothers was such as, in these times, was sure to lead to war between them. Robert, at the instigation of Odo, Bishop of Bayeux, endeavored to excite an insurrection in England. This attempt having failed, W., in revenge, invaded Normandy in January 1091. An arrangement having ultimately come to through the mediation of Philip I. of France, Robert and W. then turned their united arms against their third brother, Henry, who had purchased from Robert the district of Cotentin, comprising nearly one-third of Normandy. The fortune of war went against Henry, who was driven into exile. Returning to England, W.'s next enterprise was an invasion of Scotland. The life of W. seems to have been a continual scene of strife. Returning from Scotland, he felt himself called upon to renew the contest with his brother, who had, meanwhile, strengthened himself by an alliance with Philip of France. A pecuniary payment, however, by W. to Philip soon dissolved the bond between him and Robert. W. would now, doubtless, have taken signal vengeance on his brother, had he not been recalled to England by disturbances in Wales and in the north. In the year 1096, Robert, having resolved to go to Palestine, sold his duchy of Normandy to W., for £10,000. This transaction led to a contest between W. and a chieftain named Helle de la Fleche, who had all along disputed Robert's right to the Maine district of Normandy. Helle, was not, however, able to withstand the English monarch, who now took the field against him. He was obliged to disband his forces and take to flight. This was the last warlike achievement of William Rufus. He was shot (it is said accidentally, though there appears equally good reason to believe the act intentional) by an arrow, supposed to come from the bow of Sir Walter Tyrrel, while hunting in the New Forest, on August 2, 1100. His body was found by a poor charcoal-burner, who conveyed it in a cart to Winchester. W. inherited the courage, energy, and political talent of his father, but he was ruthless and unprincipled.

WILLIAM III., king of England, was the posthumous son of William II. of Orange, and Mary, eldest daughter of Charles I. of England. He was born in 1650. The alliance of his family with the Stuarts excited the jealousy of Oliver Cromwell, and by his influence the young prince and his attendants were declared to be excluded from the Stadtholdership of the United Provinces. W. "found himself," says Macaulay, "when first his mind began to open, the chief of a great but depressed and disheartened party, and the heir to vast and indefinite pretensions, which excited the dread and aversion of the oligarchy, then supreme in the United Provinces." The restoration of the Stuarts, however, in England, greatly improved his prospects; and on the murder of Dewitt, W., then in his 22d year, was chosen

Stadtholder. The republic was at this time carrying on an apparently hopeless war with its powerful neighbor, Louis XIV. of France; but by the wisdom and determination of the young Stadtholder, the contest, which lasted for nearly seven years, was in 1678 terminated by the treaty of Nimeguen, in a manner highly advantageous and honorable for the United Provinces. A few years before, their ruin had seemed inevitable; and the fame of W. became great over Europe. Shortly before this event, he had married his cousin, the Princess Mary, eldest daughter of the Duke of York, afterwards James II. of England. This marriage, entered into solely from political considerations, did not at first prove a happy one. W. seems to have been jealous of his wife's position, and too reserved to give utterance to his feelings. According to Macanlay, a complete explanation and reconciliation were ultimately brought about by the agency of Bishop Burnet.

In 1686, W. became the head of a league formed among the Protestant princes of Germany, the kings of Spain, Sweden, and others, having for its object to curb the power of Louis XIV. The treaty by which the alliance was constituted was signed at Augsburg in July 1686. In England, the tyranny of James II. was now beginning to estrange from him the affections of every class of his subjects. The eyes of all were turning towards the Stadtholder as their only hope. Having formed his resolution, W. conducted his operations with great secrecy and skill. On the 6th November 1688, he landed at Torbay, with an army of 15,000, composed of English and Dutch. His success was rapid and bloodless. Men of influence of all parties gave him their presence and support; and on the 18th of December following, he entered London triumphantly as a national deliverer. The adherents of James held out for some time in Scotland and Ireland; but the death of Dundee ended their resistance in the former country; while in the latter it was ended in 1691, after a vigorous contest of two years, in which the Stuart party had, in most cases, the advantage. The object of W., in accepting the crown of England, was probably not so much to free the English nation from the tyranny of James, as to enlist its power on his side against that of France. In spite of his sterling qualities, and of the debt which they owed to him, the English nation never really liked William III. The death of his wife on whom the crown had been conferred jointly with himself, in 1695, materially injured his position. His schemes were thwarted by parliament; continual plots for his assassination were hatched by the adherents of James; and in his warfare with France, victory was almost always on the side of Louis. W. being in person repeatedly defeated by Luxembourg (q. v.); and it was not without a struggle and a pang that he agreed to the terms of the peace, eminently popular, however, which was concluded at Ryswick on 10th of September 1697. The death of Charles II. of Spain in 1700, and the succession of Philip of Anjou, was another blow to his policy. He carried it on, however, with unflinching vigor till his death, which was occasioned by a fall from his horse, on 8th March 1702. The narrative of the *Macedonals* at *Glencoe* (q. v.), and his conduct to the promoters of the *Darien Scheme* (q. v.), are two blots on W.'s reputation which his most thorough-going apologists have been unable to efface. However, he was undoubtedly a practical genius of the highest order, and the services which he rendered both to England and to his native country can hardly be overrated. During his reign the Bank of England had been founded, the modern system of finance introduced, ministerial responsibility recognised, the liberty of the press secured, and the British constitution established on a firm basis. In his domestic life he committed the error of a too stern repression of all manifestation of kindly or genial feeling. His manner was wholly Dutch, and even his countrymen thought him blunt. "In his intercourse with the world in general," says Lord Macaulay, "he appeared ignorant or negligent of those arts which double the value of a favor, and take away the sting of a refusal." See Macanlay's "History of England."

WILLIAM IV., king of Great Britain and Ireland, third son of George III., was born on the 21st August 1765. Until 1771, he remained, along with the Prince of Wales and Prince Frederick, under the care of Dr Majendie. He was then sent to Kew, where, with Prince Edward, afterwards Duke of Kent, he was under the guardianship of Colonel Bude. On 15th June 1779, he entered the navy as midshipman on board the *Prince George*, then under Rear-admiral Digby. The *Prince George* then joined Admiral Rodney's squadron, on its way to Gibraltar. After seeing a

considerable amount of service, Prince W. was made a lieutenant on 17th June 1785; and in the year following, he received his commission as captain. In 1789, he was created Duke of Clarence and St Andrews, and Earl of Munster, with an allowance from parliament of £12,000 a year. Subsequent to this, several acts of insubordination rendered an actual continuance of his professional career impossible. He was, however, formally promoted through the successive ranks until he was made Admiral of the Fleet in 1801. Meanwhile, however, he had been living almost entirely ashore along with Mrs Jordan, a celebrated actress, with whom he had become connected in 1791. By her he had a family of five sons and five daughters, who became known by the surname Fitz Clarence, and were raised to titular dignities. On 11th July 1818, he married Adelaide, eldest daughter of the Duke of Saxe-Meiningen. The issue of this marriage was two daughters, both of whom died in infancy. By the death of the Duke of York in 1827, the Duke of Clarence became heir-presumptive to the throne, to which he succeeded, on the death of his brother, George IV., on 26th June 1830.

The great event of the reign of W. IV. was the passing of the Reform Bill. After a fierce and protracted struggle, the bill was read a third time in the House of Lords on 4th June 1832, and three days afterwards it received the royal assent. The first Reformed parliament met on 29th January 1833. The abolition of colonial slavery, the reform of the poor-laws, and of the Irish church, were the immediate results of the great constitutional change. King W. died, after a short illness, on 20th June 1837. He was succeeded by his niece, Queen Victoria.

WILLIAM THE LYON, one of the early kings of Scotland, succeeded his brother, Malcolm IV., in 1165. He is commonly called W. the Lion, but why he obtained that title is one of the mysteries of history. When heraldry long afterwards became a science, and was supposed to have been in use earlier than it really was, it was not unnaturally supposed that he was the first king who used, as a heraldic achievement, the lion, afterwards the chief feature in the arms of Scotland. His predecessors had long contested with the kings of England the sovereignty of Northumberland and other districts of what is now the north of England. Under Malcolm, these claims were virtually abandoned, and the king of Scots received, as a sort of equivalent for them, the earldom of Huntingdon and other valuable estates holding of the English crown. William had still, however, a hankering after the Northumbrian districts. He attended Henry of England in his continental wars, and is supposed, when doing so, to have pressed for a portion at least of the old disputed districts. In his disappointment, he invaded them, after the example of his ancestors. On the 13th July 1174, he fell, almost by accident, into the hands of an English party. For security, he was conveyed to Normandy, and there he consented, as the price of his liberation, to perform that homage for his kingdom which the English kings so long in vain attempted to exact from the government of Scotland. How far the Scots community would have admitted that he had a right to bind them to such a condition, may be doubted. The treaty of Falaise, however, as the transaction was termed, from the place where it was adjusted, was revoked in the year 1159 by Richard I. of England, in consideration of a payment of 10,000 marks, which he wanted for his celebrated expedition to Palestine. W. had several disputes with the church, but he was one of the early benefactors of the regular ecclesiastics, and founded, in 1178, the great abbey of Arbroath, which he dedicated to Thomas à Becket, who had been slain eight years earlier. King W. died in 1214.

WILLIAM, Prince of Orange, and Count of Nassau, the founder of the independence of the Netherlands, was born at Dillenburg, April 16, 1633. His father, William, was the second son of Count John of Nassau-Dillenburg, and succeeded to the German possessions of the family; while his elder brother, Henry, obtained the extensive estates in Luxemburg, Brabant, Flanders, and Holland. The latter also by his marriage with Claude of Châlons, added the charming and valuable little principality of Orange to his already extensive domains; but his son René dying without issue, left Orange, along with the Low Countries' estates, to W., in 1644. W. had hitherto lived at Dillenburg under the care of his father, who was a zealous Lutheran; but on his becoming the most powerful lord of the Low Countries, he was sent to the Queen Regent's court at Brussels, and brought

up in the Catholic faith. At the age of 15, he became page to the Emperor Charles V., who took an almost paternal care of him, attentively watched the development of his character, and, satisfied with the result, took him into his utmost confidence, making him the safe repository of the most important secrets, employed him in various diplomatic offices, and in 1555, promoted him, over the heads of all his veteran officers, to the command of the imperial army on the French frontier. In all these various situations, W. acquitted himself completely to his patron's satisfaction; displaying acute intelligence, sound judgment, and a precocious knowledge of men, while bearing himself with a grace and dignity of manner that gained universal esteem. Charles, on his abdication, strongly recommended W. to his son Philip as a confidential adviser; and accordingly, we find him employed to draw up the treaty of Cateau Cambresis, and selected as one of the four hostages to be given to France for its fulfilment. During W.'s residence in France, he was confidentially informed by Henry II. of a secret arrangement which was being formed between France and Spain for the complete extermination of heretics in both countries; and with admirable nerve, dissembling his horror of the project, he resolved in his own mind to oppose the execution of the scheme in the Netherlands to the uttermost of his power. On returning to the Low Countries, he became the leader of the party which devoted itself to the maintenance of the chartered liberties of the country, agitated for the recall of the Spanish troops, opposed the augmentation of the number of bishoprics (a pet scheme of Philip's, for his opposition to which he first incurred the bitter dislike of his sovereign), and finally broke entirely with Cardinal Granvelle, the president of the council, and the willing agent of Philip's tyranny. Expostulations to the Regent Margaret of Parma, and directly to Philip himself, far from producing any good result, seemed only to hurry the bigoted monarch to more extreme measures; the cruel edicts against heretics were made still more stringent, and at the end of 1564, the inquisition was established. W., however, steadily refused to allow these oppressive enactments to take effect in his hereditary governments of Holland and Zeeland; and though he did not join in the famous protest known as the "Compromise" which was presented to the regent by the "Beggars," he supported their proposals at court, seeing that, though maintained with somewhat too much violence, their aims were the same as his own. For the next few years, he was unremitting in his exertions to impress both the rulers and the people with the desirableness of moderation, and on several occasions succeeded by his personal influence in repressing religious dissension. Hitherto, he had labored conjointly with Counts Hoorn and Egmont, but failing to convince his two associates of the rank duplicity of the king, of which he himself was assured by means of the spies in his pay at the Spanish court, and of his perfidious designs against them, he was compelled to leave them to their fate, and retired to his German estates. Hoorn and Egmont were seized and executed; W., cited as a rebel (January 1568), and, on the ground of being a knight of the Golden Fleece and a sovereign prince, refusing to appear, had his estates confiscated, and the Duke of Alva arrived at Brussels, to reduce the provinces to submission. W. had hitherto lived in a most luxurious and extravagant manner, the splendor of his household far exceeding that of his royal master; but now he effected a thorough retrenchment, and disposed of his valuables, to equip four armies for the invasion of the Low Countries. Two of the armies failed completely; the third, under his chivalrous brother Louis, was destroyed at Jemnigen by Alva; and the fourth, 80,000 strong, under his own immediate command, lay in Brabant, unable to force Alva's army to a conflict, till want of the means of paying his soldiers forced him to retreat. His next attempt was made in 1572, and though as unsuccessful on land as before, he succeeded in exciting Holland, Zeeland, Gelders, Overysel, and the bishopric of Utrecht, to rise for their liberties; and was proclaimed by these provinces as their stadtholder for the king, whose authority he and they still acknowledged. Meantime, his conditors, the "Beggars of the Sea," had taken Brill and Flushing, and had committed heavy depredations on Spanish commerce. But ere long the fortune of the Spaniards on land was again in the ascendant; fortress after fortress fell into their hands, despite W.'s utmost efforts to relieve them; and though Holland and Zeeland still remained faithful to the cause of liberty, he found it impossible to raise

an army which could fairly cope with the enemy. He succeeded, however, by breaking the dykes, in saving Leyden, though Antwerp and Haarlem experienced all the horrors of a siege and capture. It was at this period that W. openly professed himself a Calvinist, though, with his usual moderation, he utterly disclaimed the bigoted fanaticism which characterised his co-religionists, and in which they went near to equal their adversaries the Catholics. Success still attended the patriot fleet, and though the gallant Louis, with his brother Henry, was defeated and slain at Mooker-Heide (14th April 1574), the ruinous condition of the Spanish finances, and the general detestation in which the soldiers of Philip were justly held, helped W. to hold his ground. In March 1575, conferences were opened at Breda between the belligerents, but Philip obstinately refusing to yield an iota, they were broken off; and in October of that year, the provinces of Holland and Zeeland pronounced Philip's deposition, and gave power to W. to choose the country under whose protectorate they were to be placed. Meantime the rapacity of the Spanish soldiery had roused the fifteen provinces which still remained loyal to Philip, and the league, known as the *Pacification of Ghent* (October 1576), the object of which was to drive out the foreign troops, and establish, at least for a time, toleration in religion, was the consequence. This was a brilliant success for W.; and though Don John of Austria, the new governor, tried to dissolve it by the "Perpetual Edict" (19th February 1577) in which he granted nearly all demands, W. succeeded, by skillful policy, in foiling the attempt. War was accordingly resumed, and the patriots were defeated at Gembloux (31st January 1578), though their spirits were from time to time buoyed up by an occasional success. The next governor, Alexander Farnese, succeeded, however, in detaching the Walloon provinces from the league, though, to compensate for this, W. obtained the signature of the *Union of Utrecht* (23d January 1579), the first foundation of the Dutch Republic. In the following year, his two faithful provinces, Holland and Zeeland, after having been nominally under the sway of the Archduke Matthias of Austria, and of the Duke of Anjou, proclaimed W. their sole ruler, the Duke of Anjou being still acknowledged as sovereign of the others. W., however, after his long and desperate struggle for his country's freedom, was not destined long to enjoy the honors of sovereignty, for, on 15th March 1580, Philip had, by Granvelle's advice, put a price of 25,000 gold crowns on his head, and the incitement of this magnificent bribe produced various attempts to assassinate him, the last of which, by Balthazar Gerard, was successful at Delft, 10th July 1584. W. was four times married, and left by his first wife, Anne of Egmont, Philip-William, Prince of Orange; by his second, Anne of Saxony, the famous Maurice (q. v.); and by his fourth, Louise de Coligny, Frederick-Heury, who succeeded Maurice as Stadtholder of Holland.

WILLIAM I. (Ger. Friedrich Ludwig Wilhelm), king of Prussia, and, since 1871, emperor of Germany, is the second son of Frederick-William III., and was born 22d March 1797. He joined the army at an early age, and was engaged in the campaigns of 1813—1814 against France. On the accession of his elder brother, Frederick-William IV. (q. v.), to the throne in 1840, W. became governor of Pomerania, and afterwards sat in the Prussian diet, and vigorously supported the absolutist party. In consequence, he was so much disliked by the people, that on the outbreak of the revolution of 1848 he had to flee to England; though he returned some months after, and was elected to the National Assembly. However, from this time he interfered little in the quarrels between the Constitutionalist and Absolutist, though he gladly accepted the command of the troops despatched to put down the rising in Baden; and in October 1857, the king having become incapacitated for business, W. was commissioned to act as regent, a commission renewed from time to time till his permanent installation in October 1858. At this time he was very popular in Prussia, owing to his supposed opposition to some of the obnoxious measures of the king's ministers, and to his vigorous advocacy of conjoint action with Britain and France in the war of 1854; and his election as regent was consequently opposed by the aristocratic and pietistic parties, who were, on his elevation, dismissed from power, and a more liberal ministry formed. On January 2, 1861, W. ascended the throne; and on the occasion of his coronation at Königsberg on 18th October following, he himself put the crown on his head, declaring that he "ruled by the favor of God, and of no one else." The result of the elections to the Chamber of Deputies, which were being carried on at

the same time, being much in favor of the liberal party, W., who was quite astonished at the fact of the party whom he looked upon as the opponents of the crown having a majority, attributed it to the intrigues of secret enemies; and in his address at the opening of the Chambers, saying that he "never could permit the progressive development of our inner political life to question or to endanger the rights of the crown and the power of Prussia," disclosed the principle of his policy, a policy which, with all the unflagging perseverance and unconquerable obstinacy which characterize men, like him, of thorough honesty, unflinching firmness, and considerable narrow-mindedness, he has since unremittingly pursued. The first chamber which sat after his coronation was dissolved, despite the protest of a large majority of the members; but the succeeding elections further increased the liberal majority; and though some popular measures were brought forward, and some obnoxious taxes abolished, the new chamber proved as refractory as its predecessor, and refused its consent to the extensive changes in the Prussian military system (the king's pet scheme), and to the raising of money by loan, to be applied for that and other ministerial projects, till its constitutional powers were fully acknowledged. On September 22, 1862, Herr von Bismarck-Schonhausen, formerly the ambassador at Paris, was made prime minister; and the deputies having not only rejected the ministerial budget, but resolved that the expenditure of moneys not sanctioned by them was a breach of the constitution, the chamber was dissolved. October 14, the king declaring by message, that as the three estates could not agree, he should continue to do his duty to his people, without regard to "these pieces of paper called constitutions," in which he had no faith. The number of the liberals was further increased in the following year, and the contest continued; the deputies displaying the same firmness and extreme moderation as before; while the king and his ministers made it plainly understood that if the lower chamber did what the government asked it to do, all would be well; but if not, the king would "do his duty" without its aid. However, this strife between the old feudal and the modern liberal doctrines was shelved at the close of 1863, by the able strategy of Bismarck, who revived the old dispute with Denmark regarding its government of Schleswig and Holstein, and by forcing Austria to conjoint action, contrived to make the question one of "German" interest. See *SLESWIG*. Then came the war (see article *GERMANY*) between Prussia and Austria. W. became the head of the North German Confederation in 1867. At Ems, in July 1870, took place the memorable interviews between W. and the French ambassador, Benedetti, which ended in the war of 1870-1871. W. accompanied the army, and commanded at the decisive battles of Gravelotte and of Sedan. On January 18, 1871, W. was proclaimed emperor of Germany in the palace of the French kings at Versailles; and now, as if completely to re-habilitate the old imperial title, the ancient enmity between pope and emperor has been fully revived by the recent education measures of the German government. In May 1878 the emperor was twice shot at, being seriously wounded the second time. These attempts were attributed, directly or indirectly, to Socialist influence, and have led to legislation tending to repress Socialism. W. married, 11th June 1829, Maria Louisa of Saxe-Weimar, by whom he has issue Frederick William (q. v.), the Crown Prince of Prussia; and Louisa, the present Grand-duchess of Baden.

WILLIAM II. (Frederick George Lewis), king of the Netherlands, son of William I., was born at the Hague, 6th December 1792. In 1795 his father sought an asylum in England, and a few years later went to settle at Berlin. The young prince studied at Berlin and Oxford; and in 1811, joining the army in Portugal, he served on the staff of Lord Wellington, to whom he became adjutant, and speedily obtained the rank of colonel. His bravery was conspicuous at Fuentes de Oñoro and Ciudad Rodrigo. At Badajoz, the storming column having been repulsed, the young prince met and rallied the retiring troops, leading them anew to the attack, and was the first to spring into the breach. He took an active part at Salamanca, Vittoria, and the battles of the Pyrenees. On the return of the Orange family to the Netherlands, William I. made him commander of the army. The last campaign of Napoleon brought the prince again into active service, and he gained fresh laurels at Quatre Bras and Waterloo, where he was wounded. The Prince of Orange married, 26th February 1816, Anna Paulowna, youngest sister of the Emperor Alexander I. of Russia. When the Belgian revolution began in 1830, he was called again into public life; and, as governor of the loyal districts, tried by concessions to allay the

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storm, but the provisional government at Brussels was not to be satisfied, and having over-stepped the limits of his commission, the prince was recalled. In July, he took command of the army, and pushed to the centre of Belgium; when at Louvain, his victorious course was interrupted by French intervention, and the Dutch army retired to the north. Having more liberal views than were then common, the prince took little share in state affairs, and spent his life chiefly at Tilburg, as commander of the army of observation. On the abdication of William I. (see NETHERLANDS), the Prince of Orange assumed the reins of government (1840) as William II. The political movements of 1848 were felt in the Netherlands, as in other countries; and the ministerial plans of reform not having satisfied the party of progress, the king announced his willingness to sanction whatever changes in the constitution were thought necessary, and the storm was averted. The new constitution was proclaimed 3d November 1848. W. died on the 17th March 1849, regretted by all ranks. He was marshal in the British army, and held a multitude of European orders.—See "*Hot Leven van Willem II.*," by J. J. Abbiink; also the same by Bosscha.

WILLIAM III. (Alexander Paul Frederick Lewis), reigning king of the Netherlands, was born 19th February 1817, and succeeded to the throne on the death of his father, William I., in 1849. The kingdom has since enjoyed uninterrupted peace, material prosperity has increased, and the public debt has been considerably reduced. W.'s reign has been chiefly distinguished for undertakings which contribute to the true greatness of a nation. The drainage of the Haarlem Lake (q. v.) was completed in 1852, removing an ever-enlarging enemy, and adding nearly 50,000 acres to the wealth-producing power of the country. In 1863, the slaves in the Dutch West Indian colonies were emancipated, under wise restrictions. Railways have been extensively constructed; the water-way to Rotterdam is being improved; and the Isthmus of Holland has been cut by a canal, which is continued through the IJ, and when completed will admit vessels drawing 22 feet direct to Amsterdam; while two piers have been built into the North Sea to form a harbor. While Prince of Orange, W. married, 18th June 1839, the Princess Sophia Frederica Matilda, daughter of the late King William I. of Wurtemberg. They have two sons—William Nicholas Alexander Frederick Charles Henry, Prince of Orange, born 4th September, 1840; and William Alexander Charles Henry Frederick, born 25th August, 1851.

WILLIAM AND MARY COLLEGE, next to Harvard College the oldest institution of learning in America, was established at Williamsburg, Virginia, 1693, and endowed with lands and placed under the patronage of the king and queen of Great Britain. The trustees of the Hon. R. Boyle, the English philosopher, who left his personal estate for "charitable and pious uses," presented a great part of it to this college for the education of Indians. At the Revolution it lost much of its possessions, half the students entered the army, and the French troops occupied its buildings as a hospital. Here were educated Presidents Jefferson, Madison and Monroe, Chief Justice Marshall and General Scott. In 1875—1876 there were 7 instructors and 86 students.

WILLIAMS, John, a celebrated missionary, was born at Tottenham, London, 29th Jan. 1793. At the age of 14 he was apprenticed to an ironmonger, and during his apprenticeship displayed a great taste for mechanics, and acquired a knowledge of mechanical arts, which he afterwards turned to great account. Having become deeply religious he offered himself to the London Missionary Society as a missionary to the South Seas. He was ordained 1816, and sent to Elmeo, one of the Society Islands. Two months after his arrival he was able to preach to the people in their native tongue. From Elmeo he soon went to Huahine, and afterwards to Raiatea, the largest of the Society group. His labors here were attended with great success; the island became Christian, and the arts and habits of civilisation were introduced along with Christianity. Wherever W. went, he not only preached the gospel, but instructed the people in the arts, so as to elevate them from their state of barbarism. At Raiatea, he heard of Raratonga, the chief of the Hervey Islands, and thither he went in 1823. The mission which he founded there was eminently successful; not only Raratonga but the whole group of the Hervey Islands being soon Christianised. In his missionary work, W. made great use of native teachers, trained by himself. He translated the

New Testament into the Raratongan language, and prepared books for the schools which he established. After spending some time in Raratonga, he wished to return to Raiatea; but the island in which he lived lay out of the way of vessels, and he resolved to build one. He made all the necessary tools, and in about 15 weeks completed the vessel itself, a boat 60 feet long, and 18 wide, the sails of native matting, the cordage of the bark of the *Hibiscus*, the oarum of cocoa-nut husks and banana stumps. In this vessel, during the next four years, he visited many of the South Sea Islands, extending his missionary labors to the Samoa Islands. In 1884, he came to England, where he remained for nearly four years, during which he procured the publication of his Raratongan New Testament by the Bible Society, and raised £4000 for the purchase and outfit of a missionary-ship for Polynesia. In 1888, he returned to the chosen sphere of his labors, visited many of the islands, and finally the New Hebrides, where he hoped to plant a mission, but was killed, 20th November 1889, and most of his body eaten by the savage natives of Erromanga, on the shores of which he had landed. His death was the occasion of great lamentation in the islands which owed to him their Christianisation and entire civilisation. W. was remarkably successful as a missionary, not only by his own preaching, but through the instrumentality of natives whom he trained. He possessed in an extraordinary degree the power of organising. His mechanical skill and genius were also of great service, and no other missionary has ever been so successful in making the progress of civilisation attend upon the progress of Christianity.

WILLIAMS, Roger, founder of the State of Rhode Island, U. S., was born at Conwy Cayo, Wales, in the year 1606. In his youth, he came to London, and attracted the attention of Sir Edward Coke by his short-hand notes of sermons, and speeches in the Star Chamber; and was sent by him to Sutton's Hospital, now the Charterhouse School, in 1621; and on April 30, 1624, he entered Jesus College, Oxford, where he obtained an exhibition. He studied Latin, Greek, Hebrew, French, and Dutch, and was ordained a clergyman of the Church of England, but soon became an extreme Puritan, and emigrated to New England, arriving at Boston, February 6, 1631, "a young minister, godly and zealous, with his wife Mary." He refused to join the congregation at Boston, because the people would not make public declaration of their repentance for having been in communion with the Church of England; he therefore went to Salem, as assistant-preacher, but was soon in trouble for denying the right of magistrates to punish Sabbath-breaking and other religious offences, as belonging to the first table of the Law. For his opposition to the New England theocracy, he was driven from Salem, and took refuge at Plymouth, where he studied Indian dialects. Two years later, he returned to Salem, only to meet renewed persecution and banishment from the colony, for denying the right to take the Indians' lands without purchase, and the right to impose faith and worship. He held that it was not lawful to require a wicked person to swear or pray, which were both forms of worship; and that the power of the civil magistrate extends only to the bodies, goods, and outward state of men, and not to their souls and consciences. Banished from the colony in 1635, and threatened to be sent back to England in order to prevent the infection of his new doctrines from spreading, he escaped in mid-winter to the shores of Narragansett Bay, accompanied by a few adherents, where he purchased lands of the Indian chiefs, founded the city of Providence, and established a government of pure democracy. Having adopted the belief in adult baptism of believers by immersion, W. was baptised by a layman, and then baptised him and ten others, and founded the first Baptist church in America. Later, he doubted the validity of this baptism, and withdrew from the church he had founded. In 1642, he came to England to procure a charter for his colony, and published "A Key to the Languages of America," and "The Bloody Tenent of Persecution for Cause of Conscience Discussed," &c.—his chief work on the nature and sphere of civil government. After returning to Rhode Island, he came a second time to England on business of the colony in 1651, when he published "Experiments of Spiritual Life and Health, and their Preservations," dedicated to his friend, Lady Vane, and written, as he says, "in the thickest of the native Indians of America, in their very wild houses, and by their barbarous fires;" also, "The Hireling Ministry none of Christ's, and the Bloody Tenent yet more bloody by Mr. Cotton's Endeavor to wash it White in the Blood of the Lamb." At this period he engaged in an experiment of teaching languages by conversation, and

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made the acquaintance of Milton. He returned to Rhode Island in 1654, and was elected President of the colony; refused to persecute Quakers, but held a controversy with them, and published "George Fox digged out of his Burrowes." By his constant friendship with the Indians, he was of great service to the other colonies; but they refused to remove the ban, or to admit Rhode Island into their league. He died in 1683.—See *Memoirs*, by James D. Knowles (Boston, 1833); William Gannell (Boston, 1846); Romeo Eliot (London, 1852).

WILLIAMSBURG, a city of Virginia, U. S., between York and James rivers, 60 miles south-east of Richmond, the site of William and Mary College (q. v.), and the Eastern State Lunatic Asylum. W. was founded in 1632, is the oldest incorporated town in the state, and was the colonial and state capital till 1779. A battle was fought here between General McClellan and the Confederates, May 5, 1862. Pop. in 1870, 1392; in 1880, 1,480.

WILLIAMS COLLEGE, an institution of learning in Williamstown, Massachusetts, U. S., founded by a bequest of Colonel Ephraim Williams in 1755; incorporated in 1793, with further endowments of state grant, and the privilege of raising money by a lottery. In 1836, it was provided with an astronomical and magnetic observatory, the first in America. It has since been liberally endowed by Amos Lawrence, Nathan Jackson, the government, &c., and had in 1876, 11 instructors, 170 students, and a library of 17,000 vols.

WILLIAMSPORT, a city of Northern Pennsylvania, U. S., on the West Branch of the Susquehanna. It is on the West Branch Canal, and the intersection of three railways, and is one of the three great lumber marts of the Union. It has 35 saw-mills, 18 planing-mills, 5 iron-foundries, and numerous factories. There are 23 churches, 7 banks, 2 daily and 7 other newspapers, 1 high school, and 8 public schools. Pop. in 1870, 16,030; in 1880, 18,984.

WILLIBROD, or **WILBRORD**, St. first Bishop of Utrecht, and "apostle of the Frisians," claims notice of being one of that meritorious band of British and Irish missionaries by whom Christianity was established in Northern Germany. He was born about the year 658, in the kingdom of Northumbria; and although educated in the monastery of Ripon, where he received the tonsure, was sent for final instruction, like most of the monks of that age, to the schools of Ireland. After a sojourn of thirteen years in that country, he resolved to devote himself to the conversion of Friesland, in which some of his fellow-monks had already engaged with little success. In 690, he sailed with twelve companions, and passing up the Rhine, arrived at Utrecht, the present Utrecht, soon after the victory of Pepin over the Frisians. By Pepin, they were warmly received; and W. having established the first beginnings of his mission, went to Rome in 692, whence he returned, with the sanction of the pope, Sergius I., and continued his labor till 695, when he again visited Rome, and received episcopal consecration, together with the pallium of an archbishop. Fixing his see at Utrecht, he converted a large number of the inhabitants, and extended his missionary colonies from that centre as far as the Danish provinces; and, although he received some check upon the death of Pepin in 714, yet the successes of Charles Martel enabled him soon afterwards to resume, under similar favorable auspices, the work which, after many alternations, ended in the successful establishment of Christianity. W. died at a very advanced age in 738, at the monastery which he had founded at Echternach, near Treves. His festival is the 7th of November.—See Bede's "Ecclesiastical History," chaps. 10 and 11.

WILLIS, Nathaniel Parker, American author, was born at Portland, Maine, January 20, 1807. His father became the publisher of the "Boston Recorder," said to be the first religious newspaper ever permanently established. Educated at Yale College, he obtained in 1823 a prize for "Scriptural Poems." On the completion of his college course, he established the "American Monthly Magazine," afterwards merged in the "New York Mirror," in which he was associated with George P. Morris. In 1830, he visited Europe, and contributed to the "Mirror" his "Pencilings by the Way." Appointed *attaché* to the American legation at Paris, he had favorable opportunities for observing European society; and after a visit to Greece and Turkey, returned to England in 1835, and was married to a daughter of a British officer, General Stace. While in England, on account of some personalities in his writings, more

consonant to American than English manners, he became involved in a quarrel with Captain Marryat, which led to a duel. He contributed to the London "New Monthly" his "Inklings of Adventure," also published in three vols.; and in 1839, returned to New York, and published a literary paper, "The Cornucopia," and "Letters from under a Bridge," written at a beautiful country-seat, named in compliment to his wife, Glenmary. He wrote also at this period "Tortosa the Usurer" and "Blanca Visconti," dramas, and the descriptions of scenery illustrated in Bartlett's "United States and Canada." In 1844, he engaged with General Morris in editing the "Daily Mirror." His wife died, and he revisited Europe, and published "Dashes at Life with a Free Pencil," 1845; returned to New York in 1846, he was married to a daughter of the Hon. Joseph Grinnell, of Massachusetts, and with his former partner established the "Home Journal," to which he contributed most of the following works, also published in a collected form: in 1850, "People I have Met," and "Life Here and There;" 1851, "Hurrygraphs," "Memoranda of a Life of Jenny Lind;" 1853, "Fun Jottings," "A Health-trip to the Tropics," "A Summer Cruise in the Mediterranean;" 1854, "Famous Persons and Places," "Out-doors at Idle Wild;" 1855, "The Rug-bag;" 1856, "Paul Fane, or Parts of a Life else Untold;" 1860, "The Convalescent." Much of this work was done during a long, brave struggle with what appeared to be the consumptive disease. Mr W. was an observant and thoughtful writer, discursive, fragmentary, picturesque, sprightly, quaint, and graceful, full of elaborate ease, and ingenious spontaneity. He edited the "Home Journal" (General Morris having died in 1864), and resided at his romantic highland retreat of Idle Wild, until his death, January 21, 1867.—His sister is a popular writer, under the *nom de plume* of "Fanny Fern;" and his brother, Richard Willis, is a musician and musical critic.

WILLOW (*Salix*), a genus of trees and shrubs of the natural order *Salicaceæ*, otherwise regarded as a sub-order of *Amentaceæ*. This order or sub-order, to which the Poplar (q. v.) also belongs, is distinguished by having the flowers naked or with a cup-like perianth; numerous ovules; a naked, leathery, one-celled, two-valved fruit; seeds with long hairs; leaves with stipules. In the willows, the flowers are absolutely naked, the stamens from one to five in number, the leaves simple and deciduous. There are many species, but their precise number is not likely to be soon determined, as they are very difficult to distinguish botanically, and varieties are very numerous. They are mostly natives of the colder temperate regions of the northern hemisphere, although some are found in warm countries, as *Salix tetraeperna* in the hottest parts of India, and another species abundantly on the banks of the Senegal. Most of them are shrubs, and some are of very humble growth, particularly those of arctic and alpine regions. Thus, *S. herbacea*, which is common on the mountains of Scotland, seldom rises more than an inch from the ground. *S. arctica* and *S. polaris* are the most northern woody plants. Other small species are also found to the very limits of perpetual snow in different countries, as *S. Lindleyana* on the Himalaya. Some of the species have already been noticed in the articles **OSIER** and **SALLOW**. Some of those which more generally receive the popular name W., are trees of large size, and remarkably rapid growth. The wood of some of them, as the **WHITE W.**, or **HUNTINGDON W.** (*S. alba*), and the **CRACK W.** (*S. fragilis*), is used for many purposes, being remarkably durable, especially in damp situations, although light and soft. It was anciently used for shields. Cork-cutters and others employ it for whetting sharp-edged implements. It is very tough. It is used for making paddles of steam-boats, because it wears better in water than any other kind of wood. Willows are often planted as ornamental trees, especially near streams and in moist grounds. Many kinds are also planted on the banks of rivers, to retain the soil in its place, and restrain the encroachments of the river. They are the better adapted for this purpose that they grow readily by cuttings; and willow-stakes driven into a moist soil strike root, and soon become luxuriant. The twigs of most of the willows are very tough and flexible, and are used by coopers for making hoops, and by gardeners for tying espalier trees, and for many similar purposes. They are much used for basket-making and other kinds of wicker-work. See **OSIER**. Willow withes were probably among the first ropes used by man. But the young shoots of many of the kinds with ovate or little elongated leaves, are comparatively brittle, and ill-adapted for wicker-work. Willow trees are sometimes treated as pollards, and the

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lop used for fuel and other purposes. They are also often grown as coppice-wood, yielding a great bulk of hoops, poles, fuel, &c. The leaves and young shoots are in some countries used as food for cattle, and even dried and stacked for that use. A fragrant water is distilled in the north of India from the catkins of the EGYPTIAN or CALIPH W. (*Salix Egyptiaca*). A principle called *Saltine* exists in the bark of willows, which has been found efficacious in intermittent fevers, and is sometimes used as a substitute for quinine. It is crystalline and intensely bitter.—The flowers of the W., which in many species appear before the leaves, are much sought after by bees. The male catkins of many species are very beautiful, the prominent anthers being of a fine yellow color, or as in *S. purpurea*, of a rich purple. The WEEPING W. (*S. Babylonica*), is a very ornamental species, a native of the East, now much planted in Britain, and on the continent of Europe, on account of its beautiful pendent twigs. What is called NAPOLEON'S W. is a variety of it. The White W., or Huntingdon W., is by far the largest species known in Britain. It attains a height of eighty feet, and grows so rapidly that a cutting has been known to become a tree of thirty feet in ten years. Its head is much branched and spreading, its leaves narrow elliptical-lanceolate, silky beneath, and sometimes also above.

WILLOW-MOTH (*Caradrinaoubicularis*), a species of moth of which the caterpillars feed upon the grain of wheat, often doing very much mischief. The perfect insect is of a mouse color, and its wings are closed flat upon its back when it is at rest. On the upper wings are three transverse wavy lines, and some black dots. The under wings are pearly white, with a slight tinge of brown near the fringe, and brownish nervures. The body is slender, the antennae thread-like. The whole length, without the antennae, is rather more than half an inch. The caterpillar varies in color from dull ochreous red to dirty green, with a blackish head, two brown spots on the first segment, a wavy line on each side edged with black. The chrysalis is bright brown. The moth is often abundant in summer, in hayfields, gardens, and barn-yards. The caterpillar feeds on grain through the winter, and draws the corn together with a thin silken web in February or March, when about to assume the chrysalis state.

WILMINGTON, a city and port of Delaware, U. S., on Christians Creek, near its junction with the river Brandywine, 26 m. s.-w. of Philadelphia, on the Philadelphia, Wilmington, and Baltimore Railway. It is a handsome, regular town, commanding fine water-views, and has 45 churches, a town-hall, large hospital, St Mary's Roman Catholic College, 5 banks, 18 newspapers, and manufactories of steam-engines, railway cars, and wheel car springs, iron steamboats, machinery, galvanised iron; flour-mills, powder-mills, &c. Pop. (1870) 30,841; (1880) 43,478.

WILMINGTON, a city and port of North Carolina, U. S., on the left bank of the north-east branch of Cape Fear River, 20 miles from the sea. It has a good harbor, with extensive internal navigation, and railway connections, and large exports of lumber, tar, rosin, turpentine, shingles, cotton, &c. During the war of 1861—1865, it was one of the chief ports of the Confederacy, and was frequented by blockade-runners, until it surrendered to General Terry in 1865. Pop. (1870) 12,446; (1880) 17,350.

WILNA. See VILNO.

WILSON, Alexander, American ornithologist, was born at Paisley, Scotland, July 6, 1766. He was the son of a weaver, and was apprenticed to the weaving-trade, at which he worked seven years, amusing himself at the same time by writing verse. As soon as he was free he gratified a roving disposition by mounting a pedler's pack, and went to Edinburgh to take part in a discussion, in which he maintained the poetic claims of Fergusson against Allan Ramsay, and in the same cause, wrote "The Laurel Disputed, a Poem." The piece by which he is best remembered, is a droll poem in the Scottish dialect, styled "Watty and Meg." He also contributed to "The Bee," and made the acquaintance of Burns. He was prosecuted for a lampoon upon a resident of Paisley, and condemned to a short imprisonment, and to burn the libel with his own hand at the Paisley cross. Determined to leave a country where his genius was unappreciated, he sailed from Belfast for America, and landed at Newcastle, Delaware, July 14, 1794, with a few borrowed shil-

ings in his pocket, and no acquaintances. He got work with a copper-plate printer in Philadelphia, then with a weaver; travelled as a peeller in New Jersey, where the brilliant plumage of the birds attracted his attention; then engaged as a school teacher in Pennsylvania, and then walked 800 miles to visit a nephew in New York. Teaching a school once more in New Jersey, he lived near the botanic garden of William Bertram, who was well acquainted with birds, and stimulated and encouraged in his studies of nature, W. resolved to make a collection of all the birds that were to be found in America. In October 1804, he set out on his first excursion, in which he travelled to Niagara Falls, and wrote "The Foresters, a Poem." In 1805, he learned etching of a Mr Lawson, from whom he had already learned to draw; and was employed on the American edition of "Rees's Cyclopædia." He soon prevailed upon the publisher, Bradford, to undertake an American Ornithology. In September 1808, he brought out the first volume, but in a style too costly for the tastes and fortunes of the period, so that he obtained only 41 subscribers in the eastern states, and had no better success in the southern. The second volume was, notwithstanding, brought out in 1810. In 1811 he made a canoe voyage down the Ohio, and travelled overland through the Lower Mississippi Valley, from Nashville to New Orleans, collecting specimens for his third volume. In his eager pursuit of a rare species of bird of which he long wanted a specimen, he swam across a river, and caught cold, which ended in his death, at Philadelphia, Aug. 23, 1818, when he had nearly completed his work—the 8th and 9th volumes being published after his death. It was continued by Charles Lucien Bonaparte, in 4 vols. (1825–1833). A monument was erected to his memory in Paisley Abbey churchyard in 1814.—See Grosart's "Poems and Miscellaneous Prose of Alexander Wilson" (1876).

WILSON, Daniel, LL. D., a distinguished writer on archæological subjects, Professor of History and English Literature at the university of Toronto, was born at Edinburgh in 1816. His works include "Memorials of Edinburgh" (1848); "Pre-historic Annals of Scotland" (1851); "Pre-historic Man," his chief work, (1852); a "Life of Chatterton," and a "Life of Cromwell."

WILSON, George, M.D., F.R.S.E., chemist, brother of the above, was born at Edinburgh 1818. In 1840, after studying in various laboratories, and graduating in medicine at Edinburgh, he received a license as lecturer on chemistry from the Royal College of Surgeons in that metropolis. He subsequently became lecturer on chemistry in the School of Arts, and in the Veterinary College; and in 1855 he was appointed Professor of Technology in Edinburgh University. In conjunction with this office he held the curatorship of the Industrial Museum, an institution which owes much of its completeness and order to his knowledge and skill. Professor W., who had long struggled with ill-health, died in 1859. Among his scientific works mention may be made of his "Text-book on Chemistry" in Chambers's "Educational Course," "Researches in Color Blindness," and "The Five Gateways of Knowledge." He also wrote on miscellaneous subjects, and was the author of several poems. A memoir of W. by his sister (Mrs Sime), was published in 1860.

WILSON, Horace Hayman, a distinguished Sanscrit scholar, was born in London in the year 1796, and was educated for the medical profession. In 1808 he went to India as assistant-surgeon on the Bengal establishment, and in a short time afterwards, on account of his proficiency in chemistry obtained an appointment in the Calcutta mint as assistant to Dr Leyden. He now applied himself diligently to the study of Sanscrit, and in a few years obtained so high a reputation for his scholarship, that, upon the decease of Dr Hunter, in 1811, W. was appointed to succeed him as secretary of the Asiatic Society of Bengal, on the recommendation of Mr H. T. Colebrooke. In 1813, W. published his first work, viz., "The Mēgha Dūta, or Cloud Messenger, a Poem in the Sanscrit Language, by Kālidāsa; translated into English Verse, with Notes and Illustrations, by H. H. Wilson." This work, originally published at Calcutta in 1813, was reprinted in London in the following year. His next publication was "A Dictionary, Sanscrit and English, translated, amended, and enlarged from an original Compilation prepared by Learned Natives" (Calcutta, 1819–1840). This work proved to be of great advantage to students of Sanscrit, and added considerably to W.'s reputation. His next publication was "A Collection of Proverbs and Proverbial Phrases in the Persian and Hindustani Languages; compiled and translated chiefly by the late Thomas

Roebuck" (Calcutta, 1834). To this, W. prefixed a valuable Introduction, at the same time that he edited the whole, with considerable additions of his own. Among W.'s subsequent publications are: 1. "Select Specimens of the Theatre of the Hindus, translated from the Original Sanscrit," 3 vols. (Calcutta, 1837). 2. A "Descriptive Catalogue of the Oriental Manuscripts and other Articles illustrative of the Literature, History, Statistics, and Antiquities of the South of India; collected by the late Lieutenant-colonel C. Mackenzie," 2 vols. (Calcutta, 1838). 3. "The Raghu Vansa, or Race of Raghu, a Historical Poem, by Kālidāsa, with a Prose Interpretation of the Text, by Pandits of the Sanscrit College of Calcutta" (Calcutta, 1839). Of this publication, W. was the editor. 4. "Observations on Lieutenant Burnes's Collection of Bactrian and other Coins, by H. H. Wilson and J. Prinsep" (1834). 5. "The Vishnu-Purāṇa, a System of Hindu Mythology, translated from the Original Sanscrit, and illustrated by Notes" (Lond. 1840). 6. "An Introduction to the Grammar of the Sanscrit Language, for the Use of Early Students" (Lond. 1841; 2d ed. (Lond. 1847). 7. "Ariana Antiqua, a Descriptive Account of the Antiquities and Coins of Afghanistan, with a Memoir on the Buildings called Topes, by C. Masson" (Lond. 1841). 8. "Rig-Veda-Saṃhita, a collection of Ancient Hindu Hymns, translated from the Original Sanscrit" (Lond. 1850). 9. "A Glossary of Judicial and Revenue Terms, and of useful Words occurring in Official Documents relating to the Administration of the Government of British India, from the Arabic, Persian, Hindustani, &c." (Lond. 1855). 10. "Principles of Hindu and Mohammedan Law, republished from the Principles and Precedents of the same, by the late Sir William Hay Macnaghten, and edited by H. H. Wilson" (Lond. 1860). Many of these works were produced while W. held the office of Assay-master and Secretary of the Mint at Calcutta. In his official capacity, he often received the thanks of the government of India for reforms in the coinage and other services. He was for many years secretary to the Public Instruction Committee at Calcutta, and took great trouble in directing the studies of the Hindu College. He was at the same time noted for his musical skill, and his talents as an amateur actor. In 1838, the Boden Professorship of Sanscrit was founded in the university of Oxford, and W. was elected to that lucrative post, not without strong competition. Soon after his arrival in England, he was appointed Librarian at the East India House, in succession to Sir C. Wilkins. This appointment he held in conjunction with the professorship until his death, which occurred on May 8, 1860. He was married to a grand-daughter of the celebrated Mrs Siddons, by whom he had several children. W., as an orientalist, takes rank with Sir W. Jones and H. T. Colebrooke. Many of his researches are embodied in papers contributed to the "Journal of the Asiatic Society of Bengal," and other periodicals.

WILSON, John, famous as Professor Wilson, and the Christopher North of "Blackwood's Magazine," was born on May 18, 1785, at Paisley, where his father was a wealthy manufacturer. His earlier education he received in the house of Dr M'Letchie, minister of the parish of Mearns, a wild moorland district in Renfrewshire, his boyish residence in which he long afterwards commemorated in some of his most charming essays. After having been transferred for a time to the care of the Rev. Joseph Macintyre of Glenorchy, in the Highlands, the love of which became for him a lifelong passion, he was sent to the university of Glasgow, where he remained for four years, distinguished as on the whole a diligent and successful, though somewhat fitful and irregular student. In 1803, he went to Magdalen college, Oxford, where he became notable at once for the splendor of his intellectual gifts, and for his supremacy in the various athletic sports—boxing, rowing, running, &c.—which have always formed a not inconsiderable part of the education bestowed at the English universities. In 1806, he signalized himself by his Newdigate prize poem, "On the Study of Greek and Roman Architecture;" and the year after, he took his degree of B. A., that of M. A. following in 1810. Meantime, he had left Oxford, and settled himself in Cumberland, attracted partly by the beauty of the Lake Country, and partly by a desire to cultivate the intimacy of Wordsworth, of whose genius he was already a devout admirer. He purchased the lovely little property of Elleray, where, for some years, he resided almost constantly. Besides Wordsworth, there were available in the district for intellectual converse De Quincey, Southey, and Coleridge (to whose "Friend" he contributed some essays). With all of them, he became intimate; and when he wearied a little of

"celestial colloquy divine" with them, he sought a variety to life in measuring his strength against that of the far-famed Cumberland wrestlers, the very sturdiest of whom has left it on express record that he found him "a vera bad un to lick." In 1810, he married a Miss Jane Penny, a Liverpool lady, of great personal attractions and much amiability of character, in his union of whom he found the main happiness of his life. He now seriously devoted himself to poetry; and in 1812, published his "Isle of Palms," which attracted considerable attention, and was followed in 1816 by "The City of the Plague." This work showed a marked increase of power; but it is questionable, despite the grace, music, and tender feeling of much of his verse, whether, as a poet, W. would ever have succeeded in developing the real force of his genius. His true field, however, was found on the starting, in 1817, of "Blackwood's Magazine." Some years previously, a pecuniary disaster had befallen him; the fortune of £30,000 left him by his father being so seriously curtailed by the misconduct of a relative as to necessitate the breaking up of his establishment at Ellersay. On this, he transferred himself to Edinburgh, where, in 1816, he was called to the Scottish bar; but it does not appear that he had any opportunity of practice. As one of the briefless, with plenty of spare time on his hands, along with his friend Lockhart, then in similar case, he lost no time in proffering his aid to Mr Blackwood. The astute publisher was at no loss to estimate the value of their alliance; and it is not too much to say that during its earlier years, Lockhart and W. were the soul of the success of the magazine. Presently, Lockhart was withdrawn to succeed Gifford as editor of the "Quarterly Review" in London; and W., though never in any strict sense its editor—Blackwood himself throughout exercising a severe control—became, in the eye of the public, more and more identified with the Magazine; in a certain modified, yet very real sense, to all intents for many years he was editor of the magazine, and under his famous pseudonym of Kilt North, swayed it before the world. In 1820, he was appointed to succeed Dr Brown, deceased, as Professor of Moral Philosophy in the university of Edinburgh, his friend, Sir W. Hamilton, being one of the defeated candidates. His real claims to such a post, though not to be compared with those of Hamilton—who, at that time, however, had given little or no proof before the public of his consummate accomplishment and ability—have been somewhat unduly depreciated. They were not so by Hamilton himself, whose opinion it was, as reported by Mr De Quincey, that "Wilson's philosophic subtlety of intellect was not the least wonderful of his many wonderful gifts." Thus much is certain, that as a professor, though somewhat desultory in his methods, he had an almost unexhausted power of stimulating the enthusiasm of his students. Out of his class-room, however, it must be admitted he but indifferently succeeded in attaining the staid ideal proper to the learned and respectable class of men with whom he was thus somewhat oddly associated. He was the most "muscular" of "Christians;" and on more than one occasion, the singular spectacle was exhibited of a Scotch professor of moral science taking off his coat in a public market-place, to inflict personal chastisement on some ruffian, whose obnoxious proceedings had done outrage to his nicer sense of the fitness of things. Though sedulous and strict in his discharge of his duties as a professor, W. was loyal in his adhesion to Blackwood, and his contributions to the magazine, in their mere amount enormous, continued to form the main part of his activity. In 1840, he suffered an irreparable loss in the death of his wife. His grief for a while nearly prostrated him, and seems to have sung something of a shadow over what of life remained to him. He continued, however, to contribute to "Blackwood," though now somewhat more intermittently; and in 1842, he published, as "The Recreations of Christopher North," a selection, in two volumes, from the mass of his essays furnished to it. During the session 1852—1853, he was smitten by an attack of paralysis, which permanently incapacitated him for the discharge of professorial duty; and in Edinburgh, on April 8, 1854, he died. During his last years, he enjoyed a pension of £200 a year from government, in acknowledgment of his literary services. Besides his poetry and periodical writings, he published in 1833 a volume of sketches, entitled "Lights and Shadows of Scottish Life," which was followed the year after by his tale of "Margaret Lyndesay." In these, as in his poems, the robust side of his mind is scarcely, if at all, represented; but the tender idyllic grace and charm by which they are pervaded, secured for them an extensive popularity, some portion of which they have since continued to retain. In his miscellaneous prose essays, critical

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and descriptive, and most especially in the celebrated series of dialogues entitled "*Noctes Ambrosianæ*," the true power of his genius is revealed. Of the genius, there can be little question; though as to whether it has succeeded in embodying itself in forms which are likely to be permanent, there may reasonably be difference of opinion. The materials for judgment are before the world in the collected (or rather selected) edition of his *Miscellanies*, published since his death by his son-in-law, Professor Ferrier. As a magnificent *potentiality*, it is scarcely exaggeration to speak of W. along with Burns and Scott as a member of the trinity (so to speak) of Scottish literary genius. Certain it is, that nearly as effectually as they did, he stormed the heart of the Scottish people, and became, in his later years—the Great Novelist being gone—their idol and accepted literary representative. If he has left behind him no work sacred as his literary *monument*, this much was almost involved in the conditions under which he wrote. Writing as he did from month to month for the instant purpose of the hour, wise and steady concentration of his energies became more and more difficult for him. Not the less, when all reasonable deduction is made, he holds his place as one of the most notable literary figures in the earlier half of this century. His *range* of power is extraordinary: from the nicest subtleties of feminine tenderness, he passes at will to the wildest animal riot and the most daring grotesqueries of humor; and in what he terms "numerous prose," the prose poem or rhapsody—a questionable and perilous, though, within wise limits, a legitimate form of art—he may be held, in his finer passages, to be at this day unrivalled. See the affectionate and felicitous "Memoir" by his daughter, Mrs Gordon (1863). A selection from the "*Noctes Ambrosianæ*—Comedy of the *Noctes Ambrosianæ*"—by J. Skelton, appeared in 1876.

WILSON, Richard, an English landscape-painter of great eminence, was the son of a clergyman in Montgomeryshire, and was born in 1713 at Pnuegas in that county. His early love of drawing attracted the attention of Sir George Wynne, his relation, who had him placed under the tuition of a portrait-painter in London, by name Thomas Wright. In portrait-painting, W. had considerable success, but can scarcely be said to have become eminent, when in 1749 he went to Italy to study the works of the old masters. At Venice, he formed the acquaintance of the then famous Zuccarelli, who was so struck with the merit of a careless and random landscape sketch dashed off by him as the whim of an idle moment, that he earnestly advised him to forsake portrait for landscape, as plainly his true vocation. He was further encouraged in doing so by the praises of Vernet at Rome, who was greatly charmed by some of his earlier efforts. To landscape-painting, he now exclusively devoted himself; and before returning to England in 1753, he had succeeded at Rome in establishing a considerable reputation. In London, in 1760, he exhibited his great Picture, the "*Niobe*," which was bought by the Duke of Cumberland, and at once secured him rank as one of the first painters of his time. Another celebrated work, his "*View of Rome from the Villa Madama*," was exhibited in 1765, and found a purchaser in the Marquis of Tavistock. Strange to say, however, his pictures, since so famous, failed to hit the general taste; and while far inferior artists were eagerly patronized by the public, W. was for the most part neglected. Failing in the general market, he fell into the hands of the picture-dealers, to whom he would frequently for a few pounds dispose of pictures which have since been sold for large sums. So straitened did he frequently find himself, that in 1770 he was fain to solicit, and happy to obtain, the appointment of Librarian of the Royal Academy, with the trifling salary attached to it. As explanation in part of his otherwise almost unaccountable want of success, it is alleged that his manners were rude, and his temper somewhat unaccommodating; with his brethren in art, he was notoriously the reverse of popular; and it is probable that in the general conduct of life he exhibited some lack of that tact and skill which even men of the most distinct genius may find of some little avail to procure them a prompt recognition of it. By the death of a brother, who left him a handsome sum of money, he was rescued from the indigence, as it may almost be called, in which the greater portion of his life had been passed; and retiring to Llanberria in Denbighshire, he died there some few years after in 1793. Of his numerous pictures, now much prized, many are familiar to the public by engravings; in the National Gallery, three very fine specimens of him may be found; and several others form part of the well-known Vernon Collection.

WILSON, General Sir Robert Thomas, was born in the year 1777 in London, where his father was a painter. He was educated at Westminster, and afterwards at Winchester, and when scarcely 17, he joined the 16th Light Dragoons, then serving under the Duke of York in Belgium, and took part in some sharp service, in which the regiment greatly distinguished itself. Shortly after his return to England, he was married to a lady of great beauty and some fortune, to whom, through life, he seems to have been ardently attached. In 1798, he was engaged in Ireland in the suppression of the rebellion; and the year after he served in the unfortunate campaign of the Helder, and was present with his old regiment at the battle of Egmont-op-Zee. That in everything he proved himself a capable officer, may be inferred from his appointment soon after to command the small force of cavalry which served under Sir Ralph Abercromby in Egypt. Here he formed a warm friendship with General, afterwards Lord Hutchinson, who succeeded to the command of the army after the death of Abercromby. His next service was at the conquest of the Cape of Good Hope in January 1803, where again he commanded a small cavalry force. In the latter part of that year he went abroad on the staff of his friend, Lord Hutchinson, who was sent on a mission to the king of Prussia, then a fugitive from his capital, and awaiting the result of the conflict pending between Napoleon and his allies, the Russians. W. had now, for the first time an opportunity of seeing war on a really gigantic scale, being present at the desperate battle of Eylau. (q. v.). The peace of Tilsit ensued, and W. thereupon returned to England. The struggle in the Peninsula had now commenced, and W. was sent to take part in it; he was active in the embodiment and training of the Portuguese army, and subsequently, under Wellington, he commanded a Spanish brigade at the battle of Talavera. From this field of action he was, however, withdrawn; and in 1812, he was attached to the Russian army as English military commissioner. During the tremendous struggle which resulted in the capture of Moscow, and the operations which followed in pursuit of the doomed French army, he rendered important service both in council and in the battle-field; and he seems to have won the especial regard and confidence of the Emperor Alexander. Throughout the subsequent campaigns in Germany, and those which followed in France, ending with the capture of Paris in 1814, he was present in a similar capacity in the camp of the allies. At Lützen, he took command of the Prussian reserve, and at a particular crisis of the battle, succeeded in severely checking the enemy. At Bautzen, he also distinguished himself; and a day or two after, the Emperor of Russia presented to him publicly the cross of the Order of St. George, saying that he gave it "as a memorial of his esteem for his courage, zeal, talent, and fidelity to my service." His services during this period will be found noted in every military history of the time; and they amply prove him to have been a most gallant and accomplished soldier.

After the peace, he became involved in the unfortunate matter of Queen Caroline; and for his censures of the course pursued by government he was dismissed the army. He was afterwards, however, reinstated. In 1841, he attained the rank of general; and from 1842 to 1849, he held the post of governor of Gibraltar. In 1818, he had been returned to parliament in the Liberal interest for Southwark, and he retained his seat till 1831. On 9th May 1849, having just returned from Gibraltar, he died suddenly in London. During his life, he published several works; in 1804, "An Inquiry into the Military Force of the British Empire;" in 1811, "Campaigns in Poland, with Remarks on the Russian Army;" and in 1817, a "Sketch of the Military Power of Russia." During his foreign campaigns, he kept copious private diaries; and of these, two most interesting volumes, "edited by his nephew and son-in-law, the Rev. Herbert Randolph, M.A.," were some years since published by Murray of London. A "Life" of him has likewise been published by Murray, under the same superintendence.

WILTON, a market-town and parliamentary borough in Wiltshire, at the junction of the Nadder and Wilf, affluents of the Avon, 8½ miles west-north-west of Salisbury. The New Church, a magnificent Romanesque edifice, decorated in the richest and most tasteful manner, was erected in 1844 by the Right Hon. Sidney Herbert, at a cost of £20,000. The principal industry of the town is the manufacture of carpets, especially Axminsters, and the carpets called Saxony, made of short staple wool. The burgh returns one member to the House of Commons. It is a

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station on the Salisbury branch of the Great Western Railway. Pop. of parliamentary borough (1861) 8657; (1871) 8865.

W., a very ancient, and at one time important town, was the capital of the Anglo-Saxon kingdom of Wessex, and gave name to Wiltshire. From the 9th c. to the year 1244, it was a busy and prosperous place; but in that year, the Great Western Road, which had formerly passed through it on its way from Old Sarum, was diverted, and the prosperity of the town came to a close. The town stands near the site of a monastery given to Sir William Herbert, first Earl of Pembroke, by Henry VIII.; and the locality is rich in associations connected with the Herbert family. Here Sir Philip Sidney wrote part of his "Arcadia." The present mansion is noted for its collection of statues, and for its pictures, including several excellent Van Dycks.

WILTSHIRE, or Wilts (called by the Anglo-Saxons *Wiltonshire*, from their capital town, Wilton (q. v.), one of the south-western counties of England, bounded on the w. and n. by Somerset and Gloucester, and on the e. and s. by Berks, Hants, and Dorsetshire. Area, 859,303 acres; pop. (1871) 257,177. The county is divided into two unequal parts—the plains in the north, and the hill district, which comprehends the greater part of South W.; and the separation between these two parts is very nearly that of the main line of the Great Western Railway, the course of which across the county is from north-east to south-west, past Swindon and Chippenham. The plains incline north to the basin of the Thames, which forms in part the northern boundary, and are noted for their agricultural capabilities. The surface of this district is checkerboarded with corn-fields and rich pastures, and here the cheeses for which W. is favorably known are produced. The hill district (on the chalk) presents ranges of bleak downs, with deep valleys, and is thinly peopled, much of it consisting of solitary sheep-walks, of which it is estimated 100,000 sheep are pastured. Inkpen Beacon, 1011 feet high, at the junction of W., Hampshire, and Berkshire, is the nucleus whence proceed the North and South Downs of Surrey and Sussex, and the hills which, running south through this county, become the North and South Downs of Dorsetshire. Agriculture is carried on with the assistance of modern improvements; many swine are reared, and W. bacon is famous. Portland stone is quarried at Swindon, Tisbury, and in other localities; a fine oolite, known as Bath stone, is extensively worked at Box and the neighborhood; and a stone called Forest Marble yields coarse tiles and flagstones, and often retains in perfect preservation "the ripple-marks of waves and the footprints of crustaceans." The manufacture of woven goods, carpets and other woollen goods, silks and linens, is carried on at Trowbridge, Wilton, Bradford, Devizes, Westbury, &c. There are iron mines and blast-furnaces at Wesbury and Seend, and Swindon is one of the greatest railway workshops in the kingdom. The principal rivers are the Thames, with its tributary, the Kennet; the Bristol Avon (which communicates with the Thames and Severn by the Wilts and Berks Canal, and again with the former by the Kennet and Avon Canal), and the Salisbury Avon, with four tributaries spreading over the whole of South W. The county sends four members to the House of Commons, and the boroughs 14 more. Before 1832, W. had 34 members. Cap., Salisbury; but the assizes are held alternately there and at Devizes.

W. abounds in early and interesting antiquities. Among these may be mentioned its Druidical temples (see **AVEBURY** and **STONEHENGE**), British entrenchments, roads, and villages, burrows (in which beads, rude axes of stone, arrow heads of flint, and sometimes articles in gold, brass, or iron, have been found along with the relics of mortality), Saxon encampments, Roman roads and Roman castles, of which there are many remains. Longleat, Wilton, Boxwood, Stonhead, and Corsham are the most remarkable modern houses of the nobility.—See "History of Ancient Wiltshire," by Sir R. C. Hoare.

WINCHESTER, a famous historical city, and parliamentary and municipal borough, chief town of Hampshire, is situated in the middle of the county, on the right bank of the Itchen, 67 miles south-west of London by railway, and 60 in a direct line. It consists of one main street, crossed by a number of streets running at right angles to it, and was in early times surrounded by a wall, of which remains exist. The houses for the most part spread over a hill rising from the valley of the Itchen; but the cathedral, and some of the older and more interesting portions of

the city, stand on level ground close to the river-bank. The Castle-hill is the site of the old castle or royal palace, built in the 13th c. by Henry III., and of a magnificent hall, of which the only remaining portion is used as the County Court. About a mile from the town is the famous hospital of St Cross, founded in 1186 by a bishop of W., Henry de Blois, for 13 poor men, "decayed and past their strength." It was munificently endowed; but its sources of income have been narrowed, and its ancient charters and grants were destroyed during the 18th century. Its income is £1088 per annum, and it supports 13 poor brethren, affords relief to a number of external poor, and distributes general doles on the eves of great festivals. The hospital is entered by a gateway, after passing which a pleasing view is obtained of the buildings, which occupy three sides of a quadrangle, the fourth side being occupied by a neat, picturesque, ancient church in Transition Norman, which formed part of the Institution. There is a city library and a museum; the latter contains some very interesting local antiquities. Charles II. commenced a palace here, but the part completed is now used as barracks. The city cross in the High Street, dating from the 15th c., is very beautiful in design.

The college of W., called originally "Seinte Marie College of Wynchestre," now Saint Mary's or Winchester College, was founded by William of Wykeham, bishop of W., in 1387, and the buildings were completed in 1393. The buildings are, for the most part, of the age of the founder, and consist of two quadrangles and a cloister, together with recently erected houses for the commoners. The famous *Dolce domum* is sung by all the boys in the courts of the college before the breaking up of the school at the long vacation. The foundation consisted originally of a warden, 10 Fellows, 70 scholars, a head-master (*informator*), an usher (*ostiarium*), or second-master, 3 chaplains, 8 clerks or singing men, and 16 choristers. By an ordinance of the Oxford University Commission, which took effect in 1857, the number of Fellowships has been reduced, as vacancies occurred, to six, the number of scholars being increased to 100, and 20 exhibitions have been founded. The charter of the school, which is in existence, was granted by Richard II. in 1396, and confirmed by all the subsequent sovereigns, Mary excepted, down to Charles II. The visitor is the bishop of W., and the warden and two Fellows of New College, Oxford, hold an annual "scrutiny," which, however, is generally merely formal. The endowment, which amounts at present to about £17,600 annually, consists of landed property and funded stock; and of this about £2,600 goes to expenses of management. The Warden and Fellows are the governing body of the college. The pupils of the school are of two classes—foundation scholars and commoners. The scholars are elected, between 10 and 14 years of age, by competitive examination; the average annual number of vacancies being 10, and the number of candidates 150. The scholars are well boarded, lodged and educated, at the expense of the foundation; having to pay, for some incidental charges, only from £1 10s. to £5 14s. per annum; but tradition exercises a powerful influence at W., and many of the quaint old customs of the school, such as dining off wooden trenchers, &c., are still retained. The number of the commoners has fluctuated much; but owing to the better position in which they were placed by the new regulations of 1857, they have averaged 200 annually for some years; they generally enter between 11 and 16 years of age, and stay 3–4 years, and not being foundation-boys, are boarded in the houses of the head and other masters, at a total annual cost of about £115 (including expense of tuition, pocket-money, and cost of travelling). W. possesses 15 fellowships and 30 scholarships at New College, Oxford (also founded by William of Wykeham), open to scholars and commoners alike, and tenable for five years, besides numerous other prizes. Fagging is permitted to the 18 chief boys, who are called "prefects." The monitorial system was first established in this college.

A church is said to have been built at W. in the year 169; to have been destroyed in 268, restored in 293, and converted into a "temple of Dagon" (by whom we are to understand Wodan) by the Saxons under Cerdic in 495. In 635, the polluted church was pulled down, and a new one commenced, under the superintendence of Birinus, the first apostle of Wessex; and king Kynegil, granted the whole of the land for the space of seven miles round the city for the support of the episcopal seat and the re-established monks. From the year 674, the successors of bishops of W., of which the celebrated St Swithun (see SWITHUN, St) was one, continues unbroken. Of Birinus's cathedral, however, in which most of the Saxon kings of Wessex (see HEPTARCHY) were interred and on

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the altar of which, according to tradition, King Canute hung up his crown after the well-known scene on the sea-shore, no portion remains, and a new cathedral—the present one—was built “from the foundations” by Bishop Walkelin (1070–1097); and after its completion, and the removal into it of the precious relics of Bilius's cathedral, that old edifice was pulled down. William of Wykeham was bishop of W. from 1367 to 1404, and has more closely than any other bishop associated his name with his episcopal city and its cathedral. He greatly enlarged and beautified the building, and he began the remarkable transformation of the nave from Norman to Perpendicular. The cathedral is 520 feet long, longer than any other English cathedral, with the exception of those of Ely (560 feet), and Canterbury (525 feet). Its breadth at the transepts is 208 feet, the length of its nave is 351 feet, its height 86 feet, and a low central Norman tower 150 feet high. The exterior is somewhat disappointing, owing to its unusual want of decoration, and to the lowness of the tower; but the interior is magnificent, and contains many objects of the highest interest—as the tomb of William Rufus; bronze figures of Charles I. and James I.; mortuary chests which contained the ashes of a number of West Saxon kings and bishops, but which were rifled during the Civil War; the golden shrine of St Swithin, with some excellent specimens of sculpture, both ancient and recent; the tomb of Edmund, the son of King Alfred, and the tomb of Ismak Walton. The various architectural styles to be noted in the cathedral are: Early Norman in the crypt and transepts; Early English in the eastern aisles and chapels behind the presbytery; Decorated in the piers and arches of the presbytery and Perpendicular in the nave, which, for beauty and grandeur, is only rivalled by York. After the cathedral, there are some churches of interest in the Transition Norman and Perpendicular styles; and there are many other buildings of a religious and educational kind. The industries of W. are unimportant. Pop. of municipal and parliamentary borough (1871), 14,706, represented by two members.

W., the Roman *Venta Belgarum*, was the site of a British city before the arrival of the Romans in Britain, *Caer-Gwent* (*Gwent* = *champaign* or down). It afterwards became a Roman station, and, as such, was a place of considerable importance, and contained temples of Apollo and Concord. When taken by the Saxons in 495, it is said to have contained at least one Christian church. The Saxons called the town *Wintancester*. As the capital of Wessex, W. became the capital of England, and even after the Norman Conquest was long a chief royal residence. In 1265, during the barons' war, W. was sacked, and it never again recovered its commercial prosperity. From the time of Charles II., the town has gradually declined—its chief sources of life and movement being the cathedral and the college.

WINCHESTER, a city of Virginia, U.S., in the valley of the Shenandoah, 150 miles north-north-west of Richmond, 67 west-by-north from Washington; 32 miles by railway to Harper's Ferry. It has 15 churches, an academy, two newspapers, manufactures of shoes, gloves, furniture, soap, &c. March 12, 1862, it was occupied by the Federal General Banks, and was during the war the scene of frequent conflicts, and occupied in turns by the Federal and Confederate armies. Pop. in 1870, 4,477; in 1880, 4,958.

WINCING MACHINE, the wheel used by dyers for winding out of their dyed long pieces of cloth. The vat is often divided by a partition, and the wincing-machine is generally so placed that it will wind the piece of cloth from one compartment to the other, according to the direction given to the handle.

WINCKELMANN, Johann Joachim, well known as the critical expounder and historian of ancient classical art, was born of poor parents in the year 1717, at Stendal, in Prussia. He very early shewed an eager desire for knowledge, and being sent to the free school of the place, became so special a favorite with the rector of it, that he was taken into the rector's house as a companion, when age and blindness made some assistance necessary to him. After study for a time in Berlin, he went, in 1738, to the university of Halle, where he remained two years engaged in the study of theology, which, however, he found so distasteful that, at the end of that time, he relinquished it, accepting a situation as tutor in a private family at Osterburg. In 1743, he became a schoolmaster at Seehausen—a wretched position, from which he was rescued by the Count von Bunnau, who employed him as secretary in his library at Nothwitz. Here he remained some years. Being in the vicinity of

Dresden, he had frequent opportunities of inspecting the famous treasures of art accumulated there. He also made the acquaintance of some artists of eminence, among others, the well-known Oeser; and the enthusiasm was awakened which determined his subsequent career. To the theory and history of art he now resolved to devote himself; and on being thrown into the society of the Pope's nuncio, Cardinal Archinto, he was induced, after some hesitation, to become a Roman Catholic, on a promise of a pension being procured for him, to enable him to proceed to Rome. Thither he repaired in 1766, having previously published at Dresden a treatise, entitled "*Gedanken über die Nachahmung der griech. Werke*," &c. (*Reflections on the Imitation of the Antique*, 1764). Of this work he issued, in 1766, a new and enlarged edition. At Rome, he prosecuted his studies with the utmost ardor, and every facility was afforded him. In 1768, he visited Naples, to examine the celebrated remains of Herculaneum, Pompeii, and Pæstum; and went also to Florence, for the purpose of cataloguing the famous collection of antique gems belonging to Baron de Stoeck, a labor which occupied him for nine months. Soon after, the Cardinal Albani appointed him his librarian, and the salary attached to this post, with the pension continued from Dresden, in itself a somewhat menagre pittance, enabled him to prosecute his studies in comfort. The first-fruit of these appeared in his treatise, entitled "*Anmerkungen über die Baukunst der Alten*" (*Remarks on the Architecture of the Ancients*), which was printed in Germany in 1769; and two years afterward, the great work of his life, on which he had been long engaged, the celebrated "*Geschichte der Kunst des Alterthums*" (*History of Ancient Art*), was issued from the press of Dresden. In 1767, a supplement to it was added. He also gave to the world the result of his researches at Herculaneum; and in 1766, his "*Monumenti Antichi Inediti*," an elaborate work with plates.

In 1768, W., by this time famous throughout Europe, set out to revisit Germany. His destination was Berlin; but on the way, a strange yearning seized him for the Italy he had left; on his reaching Munich, it was no longer to be resisted; and he started thence on his return to Rome. He went by Vienna, where the most flattering attentions were paid him; proceeding thence to Trieste, where he came by his tragic end at the hands of a fellow-traveller, by name Francesco Arcangeli, who murdered him in order to plunder his effects. In this he did not succeed, being scared almost in the act, and presently caught and executed.

W. was the forerunner of a great movement; and his influence has been deeply felt in all the subsequent literature of the subject to which he devoted himself. Even at this day, when a good deal of it is regarded as obsolete, his great "*History*" remains as a work not to be neglected by any one seriously concerning himself with the study of this branch of æsthetics. The most complete edition of W.'s works is Fernow, Mayer, and Schulze's (8 vols. new ed. Leip. 1829).

WIND is air in motion. The force of the wind is measured by Anemometers (q. v.), of which some measure the velocity, and others the pressure. The following are a few velocities of wind, translated into popular language: 7 miles an hour is a gentle air; 14 miles, a light breeze; 21 miles, a good steady breeze; 40 miles, a gale; 60 miles, a heavy storm; and 80 to 100 miles, a hurricane sweeping everything before it. We also add a few comparisons of velocity and pressure: 5 miles an hour is a pressure of 2 oz. on the square foot; 10 miles, $\frac{1}{2}$ lb.; 20 miles, 2 lbs.; 30 miles, $4\frac{1}{2}$ lbs.; 40 miles, 8 lbs.; 50 miles, 13 lbs.; 60 miles, 18 lbs.; 70 miles, 24 lbs.; 80 miles, 33 lbs.; and 100 miles, 50 lbs. During the severe storm which passed over London, on February 6, 1867, the anemometer at Lloyd's registered a pressure of 35 lbs. to the square foot—in other words, the wind during that storm acquired a velocity of 83 miles an hour. Wind is most frequently measured by estimation.

Seamen have more need than landmen to pay attention to every minute variation in the strength of the wind, as well as its direction, and to adopt such phrases as will render that strength generally intelligible. The *Anemometer* (q. v.), which is used on land by scientific men for this purpose, is unsuited to the wants of seamen. They have found it convenient to divide winds into twelve kinds, in relation to strength, designated thus: *fatul air, light air, light breeze, gentle breeze, fresh breeze, gentle gale, brisk gale, fresh gale, strong gale, hard gale, and storm*. Each of these is determined, by the amount and kind of sail which a ship

can safely carry at that moment. The estimate of the wind's force by the scale 0 to 12, means that 0 represents a calm, and 12 a hurricane. If such estimations be divided by 2, and the quotient squared, the result will be the pressure in pounds, approximately.

All wind is caused, directly or indirectly, by changes of temperature. Suppose the temperature of two adjacent regions to become, from any cause, different, the air of the warmer, being lighter, will ascend and flow over on the other, whilst the heavier air of the colder region will flow in below to supply its place. Thus, then, a difference in the temperature of the two regions gives rise to two currents of air—one blowing from the colder to the warmer along the surface of the earth, and the other, from the warmer to the colder, in the upper regions of the atmosphere; and these currents will continue to blow till the equilibrium be restored.

Winds are classed into *Constant*, *Periodical*, and *Variable* Winds.

CONSTANT WINDS.—*The Trade-wind.*—When the part of the earth's surface which is heated is a whole zone, as in the case of the tropics, a surface-wind will set in towards the heated tropical zone from both sides, and uniting will ascend, and then separating, flow as upper currents, in entirely opposite directions. Hence, a surface current will flow from the higher latitudes towards the equator, and an upper-current towards the poles. If, then, the earth were at rest, a north wind would prevail in the northern half of the globe, and a south wind in the southern half. But these directions are modified by the rotations of the earth on its axis from west to east. In virtue of this rotation, objects on the earth's surface at the equator are carried round toward the east, at the rate of 17 miles a minute. But as we recede from the equator, this velocity is continually diminished; at lat. 60°, it is only $8\frac{1}{2}$ miles a minute, or half of the velocity at the equator; and at the poles it is nothing. A wind, therefore, blowing along the earth's surface to the equator, is constantly arriving at places which have a greater velocity than itself. Hence, the wind will lag behind, that is, will come up against places towards which it blows, or become an *east* wind. Since, then, the wind north of the equator is under the influence of two forces—one drawing it south, the other drawing it west—it will, by the law of the composition of forces, flow in an intermediate direction, that is, from north-east to south-west. Similarly, in the southern tropic, the wind will blow from south-east to north-west. All observation confirms this reasoning. From the great service these winds render to navigation, they have been called the Trade-winds. It is only in the Pacific and Atlantic Oceans that the trade-winds have their full scope. In other parts of the trades' zone, such as Southern Asia and intertropical Africa and America, they are more or less diverted from their course by the unequal distribution of land and sea, as explained under *Monsoon* (q. v.).

In the Atlantic, the *North Trades* prevail between lat. 30° and 30°, and in the Pacific, between lat. 30° and 26°; and the *South Trades*, in the Atlantic, between lat. 4° n. and 23° s., and in the Pacific, between lat. 4° n. and 33° s. These limits, however, are not stationary, but follow the sun, advancing northward from January to June, and southward from July to December.

Region of Calms.—This is a belt, 4° or 5° broad, stretching across the Atlantic and Pacific, parallel to the equator. It marks the meeting-line of the north and south trades, where they mutually neutralize each other. Here also occur heavy rains, and thunder-storms almost daily. This belt varies its position with the trades, reaching its most northern limits in July, and its most southern in January. When the belt of calms nears the African coast, in the Gulf of Guinea, the copious rainfall gives rise to the strong steady-blowing gales of that coast, called *Tornadoes*.

Return Trades.—It is proved by observation that, while there is within the tropics a surface-wind blowing toward the belt of calms, there is at the same time prevailing, in the higher region of the air, a counter-current constantly flowing toward the poles. These great aerial currents descend to the surface after they have passed the limits of the trade-winds, forming the south-west or west-south-west winds of the north temperate, and the north-west or west-north-west winds of the south temperate zones. The *westing* of these great equatorial currents is produced by the same cause that gives *easting* to the trade-winds, viz., the rotation of the earth on its axis. Owing to the interference of the north-east or polar current with these winds, the irregular distribution of land and water, mountain and plain, and storms diverting them out of their course, they do not blow with the constancy of the regular

trade-winds. They are, however, sufficiently marked and decided to be classed with the constant winds.

PERIODICAL WINDS.—Land and Sea Breezes.—These are the most general, as well as most easily explained, of the periodical winds. On the coast, within the tropics, a breeze sets in from the sea in the morning, at first a mere breathing on the land, but gradually it increases to a stiff breeze in the heat of the day, after which it sinks to a calm towards evening. Soon after, a contrary breeze springs up from the land, blows strongly seaward during the night, and dies away in the morning, giving place to the sea-breeze as before. These winds are caused during the day, by the land getting more heated than the sea, consequently the air over it ascends, and the cool air from the sea flows over on the land to supply its place; and during night, by the temperature of the land falling below that of the sea, and the air becoming thereby heavier and denser, flows over the sea as a land breeze. It is within the tropics where sea-breezes are most marked and constant because there the sun's heat is greatest, and atmospheric pressure is practically uniform, except in those rare instances where it is disturbed by hurricanes. But in countries such as Great Britain, where atmospheric pressure is most commonly, to some extent, greater or less than that of surrounding regions, the strength of the wind blowing from the high to the low barometer is far stronger than that which would result from the disturbance caused by the unequal heating of land and water; and consequently the sea-breeze is not felt. In the warm months, however, when barometers are nearly equal over northern and western Europe, there is a gentle sea-breeze all round Great Britain during the heat of the day, and a land-breeze during night. Quite analogous to the land and sea-breezes are the Monsoons (q. v.), which are only the north trades drawn out of their course in summer by the heated regions of Southern Asia—the south-west monsoon being only a vast sea-breeze blowing on Southern Asia, and continuing several months of the year.

VARIABLE WINDS.—These winds depend on purely local or temporary causes, such as the nature of the ground, covered with vegetation or bare; the physical configuration of the surface, level or mountainous; the vicinity of the sea or lakes; and the passage of storms. Within the tropics, all except the last of these is borne down by the great atmospheric currents, which prevail there in all their force. But in higher latitudes this is not the case; these, therefore, are the regions where variable winds prevail. The most noted of these winds are the Simoon (q. v.), Sirocco, Solano, and Harmattan (q. v.). The *Puna Winds* prevail for four months in the year in a high barren table-land in Peru called the Puna; as they are part of the south-east trade-wind, after having crossed the Andes they are drained of their moisture, and are consequently the most dry and parching winds that occur anywhere on the globe. In travelling over the Puna it is necessary to protect the face with a mask from the glare and heat of the day, and from the intense cold of the night. The *East Winds* which prevail in the British Islands in spring are part of the great polar current which at that season descends over Europe through Russia. Their origin explains their dryness and unhealthiness. It is a prevalent notion that the east winds in this country are damp. It is quite true that many easterly winds are peculiarly damp; all that prevail in the front part of Storms (q. v.) are very damp and rainy, they being simply an indraught of the air towards the low barometer which is advancing from the west at the time; and it is owing to this circumstance that in the east of Scotland the greater part of the annual rainfall falls with easterly winds. All of these damp easterly winds, however, soon shift round to some westerly point. But the genuine east wind, which is the dread of the nervous and of invalids, does not shift to the west, and is specially and intolerably dry. In the third week of May 1866 this character was strongly marked, when at many places in Scotland the humidity was only 40, and on some occasions as low as 29; the degree of this dryness will be appreciated when it is stated that the driest month during eleven years ending with 1866, shewed a humidity only of 73, saturation being 100. While this wind lasted, the daily range of temperature was double the usual amount, the soil was parched, and the leaves of trees and plants were blackened and destroyed. Deaths from brain-diseases and consumption reach the maximum in Great Britain during the prevalence of east winds. The *Etesian Winds* are northerly winds which prevail in summer over the Mediterranean Sea. They are caused by the great heat of North Africa at this

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season, and consist in a general flow of the air of the cooler Mediterranean to the south, to take the place of the heated air which rises from the sandy deserts. The *Mistral* is a steady, violent north-west wind, felt particularly at Marseilles and the south-east of France, blowing down on the Gulf of Lyons. The *Pampero* blows in the summer season from the Andes across the pampas of Buenos Ayres to the sea-coast. It is thus a north-west, or part of the anti-trade of the southern hemisphere, and so far analogous to the stormy winds which sweep over Europe from the south-west. But since it comes from the Andes over the South American continent, it is a dry wind, frequently darkening the sky with clouds of dust, and drying up vegetation.

Lord Bacon remarked that the wind most frequently veers with the sun's motion, or passes round the compass in the direction of n., n.e., e., s.e., s., s.w., w., and n.w., to n. This follows in consequence of the influence of the earth's rotation in changing the direction of the wind. Professor Dove of Berlin has the merit of having first propounded the *Law of the Rotation of the Winds*, and proved that the whole system of atmospheric currents—the constant, the periodical, and the variable winds—obey the influence of the earth's rotation.

WINDAGE, in a Gun, the difference in diameter between the bore of the piece and the projectile with which it is loaded. Formerly, a considerable windage was allowed; but this only served to diminish the force of the explosion, and to give an irregular motion to the shot. In the present rifled artillery, it is sought to reduce the windage to a minimum, as .01 of an inch. Some windage is indispensable, or the shot would jam either going in or coming out.

WINDAGE (from cannon-balls), or **Wind Contusions**. Military surgeons so often meet with cases in which serious internal mischief (as, for instance, the rupture of the liver, concussion of the brain, or even a comminuted fracture of a bone) has been inflicted, without any external marks of violence to indicate its having resulted from the stroke of a cannon-ball, that they were led to the conclusion that solid objects projected with great velocity through the air might inflict such injuries indirectly by aerial percussion; the hurt being inflicted either directly by the force with which the air is driven against the part, or indirectly by the rush of air to refill the momentary vacuum created by the rapid passage of the ball. So many observations have, however, been made of cannon-balls passing close to the body (even shaving part of the head, tearing away portions of uniform, or carrying off the external ear or the end of the nose without further mischief), that this hypothesis is totally untenable, and is now generally rejected. The true explanation of the cases formerly attributed to the windage of cannon-balls appears to rest, according to recent views, "in the peculiar direction, the degree of obliquity with which the missile impinges on the elastic skin, together with the situation of the structures injured beneath the surface, relatively to the weight and momentum of the ball on one side, and hard resisting substances on the other." See Longmore's article on "Gun-shot Wounds," in Holmes's "System of Surgery," vol. ii., pp. 18—20, where the subject is fully discussed.

WINDERMERE, **WINANDERMERE**, or **LAKE WINDER**, the largest lake in England, called, on account of the supposed superiority of its shores, in point of natural beauty, over those of the other lakes of North-western England, the "*Queen of the Lakes*," is partly in the county of Lancaster, and partly divides that county from Westmoreland. It is 11 miles long, and about 1 mile in extreme breadth, is fed by the Brathay and the Rothay, the waters of which become united before entering the lake, and by the streams which drain the neighboring lakelets of Esthwaite, Troutbeck, and Blelham, and discharges its surplus waters southward into Morecambe Bay by the Leven. Next to *Wast Water* is the deepest of all the English lakes, its greatest depth being 240 feet, while *Wast Water* is 270 feet deep. It contains a number of islands, the largest being 28 acres in superficial extent, and the chief of which are *Rough Holm*, *House Holm*, *Lady Holm*, and *Carwen's* or *Belle Isle*. Soft rich beauty is the principal characteristic of the islands of the lake, of the wooded shores, and of the scenery around; there being a total absence of that wildness and sublimity which characterises some of the other lakes, except at the north end, where *Langdale Pikes*, *Harrison Stickle*, *Sea Fell*, and *Bow Fell* stand forward pro-

minently in the landscape. The east and west shores are bounded by gentle eminences exuberantly wooded, and numerous villas and cottages peeping out of the woods give an aspect of quiet domesticity to the landscape. About a mile from Waterhead, at the north extremity of the lake, is the town of Ambleside, $1\frac{1}{2}$ mile north-west of which is Rydal, the residence of the poet Wordsworth; in the vicinity of Waterhead is Dove's Nest, the cottage at one time occupied by Mrs Hemans; further down the east shore is Elleray, famous as the residence of "Christopher North;" and half-way down the lake, on the eastern shore, is Bowness.

WINDGALLS are puffy swellings about the joints of animals, particularly of horses, correspond to the ganglions of human surgery, and result from irritation and inflammation being set up within the delicate synovial cavities, which thus secrete an unusual quantity of thickened synovia. Rest, moderate work, wet bandages, and occasional blisters reduce the swellings, but with fast roadwork they are apt to reappear, especially in old horses.

WINDHAM, Right Hon. William, English statesman, born 1750, in Golden Square, London, was son of Colonel Windham of Felbrigg Hall, Norfolk, in which county the family had been settled since the 14th century. He was educated at Eton, and was afterwards sent to Glasgow University, where he studied mathematics with success. In 1761, he entered at University College, Oxford. After the usual course of travel, he began to acquire notoriety as an opponent of the administration of Lord North. His oratorical exercises were interrupted by a design of visiting the North Pole, and he accompanied the expedition in which Neison, then a youth, took part. He found the sea-sickness intolerable, was put on shore in Norway, and returned home in a Greenland whaler. In 1781, he was returned to parliament for Norwich, and took his seat among the Whigs. In 1783, on the formation of the Portland ministry, remarkable for the coalition of Lord North and Mr Fox, he became principal secretary to Lord Northampton, then lord-lieutenant of Ireland. Before leaving England, he called upon his friend Dr Johnson, and lamented that his situation would compel him to sanction practices he could not approve. "Don't be afraid, sir," replied the doctor "you will soon make a very pretty rascal." Ill-health, or, perhaps, conscientious scruples, soon caused him to resign his secretaryship. In 1784, he seconded Burke's motion for a representation to the throne on the state of the nation. There is an admirable and characteristic sketch of W. in Macaulay's description of the trial of Warren Hastings: "There, with eyes momentarily fixed on Burke, appeared the first gentleman of the age, his form developed by every manly exercise, his face beaming with intelligence and spirit—the ingenious, the chivalrous, the high-souled Windham." Abandoning his old friends the Whigs, he followed Mr Burke, and ranged himself on the side of Mr Pitt in opposing the speculative doctrines of the French Revolution, and supporting the war with France. In 1794 he became secretary-at-war under Mr Pitt, with a seat in the cabinet. He now attacked his former friends with the utmost acerbity. He went out with Pitt in 1801, and sided with the Grenvilles in stigmatising the peace of Amiens, concluded by the Addington administration in 1801. This lost him his seat for Norwich, but he was elected for St Mawes, and on the return of the Grenville party to power, he became colonial secretary. In 1806, he brought forward his plan of limited service in the army, proposing that the infantry should be enlisted for seven years only, with liberty to renew their services for another seven years, receiving an increase of pay; cavalry and artillery to be enlisted for ten years, the second period six, and the third five years. He also proposed to increase the pay and pensions of officers and men, and generally to better the condition of the soldier. The plan was strenuously opposed, but passed into a law. He went out of office in 1807, when the Portland administration was formed (having previously declined the offer of a peerage), and strongly denounced the expedition against Copenhagen, and afterwards the disastrous Walcheren expedition. In 1808, a clause was introduced by Lord Castlereagh (who had succeeded W. in office) into the Mutiny Act, permitting men to enlist for life, contrary to W.'s scheme of limited service, which was, however, re-adopted in 1847. In May, he underwent a surgical operation for extracting a tumor from his hip, from the effects of which he died June 3, 1810.

Wind
Windmill

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W. was an excellent speaker, and one of the most effective and skilful debaters of his time, as will appear from his speeches collected by Mr Amyott, his secretary, and published, with a Life prefixed, in 3 vols. 8vo. Fox said he had never met a meditating man with so much activity, or a reading man with so much practical knowledge. Pitt declared that his speeches were the finest productions possible of a warm imagination and fancy. Canlins described his eloquence as, if not the most commanding, at least the most insinuating that was ever heard in the House of Commons. Dr Johnson, who was much attached to him, declared that, in the regions of literature, W. was *inter stellas luna minores*. He possessed brilliant conversational powers. Yet, notwithstanding his great talents and rare gifts, he appears in the page of history as the mere shadow of a man. In his lifetime, he gained the disparaging nickname of "the weather-cock." He was fond of paradox, and once defended bull-baiting in the House of Commons with great vivacity and ingenuity. Although a man of refinement and sensitiveness, he had a passion for pugilism, and was a regular attendant upon prize-fights. The publication of his "Diary from 1784 to 1810," by Mrs Henry Barling (1866) discloses the secret of his weakness. Morbidly self-conscious, he was always watching himself, pulling himself to pieces, and recording the doubts that haunted him as to his mental capacity. Acknowledged by his contemporaries to be one of the meanest of men, he succeeded in infusing into his mind doubts with respect to his own courage. He got rid of this delusion by going under fire in the trenches at the siege of Valenciennes; but no sooner was he convinced that he was not a coward than he began to be afraid he was discreditably insensible to the scenes which were passing around him! With brilliant faculties, he was in fact an intellectual hypochondriac incapable of achieving anything great.

WIND-INSTRUMENTS, musical instruments of which the sounds are produced by the agitation of an enclosed column of air. They are generally classified into *wood instruments* and *brass instruments* (both of which are played by the breath), and the *organ*.

The name wood instruments is applied to musical instruments constructed either of wood or of ivory, of which the principal are the flute, piccolo, clarinet, flageolet, basset-horn, oboe, and bassoon. They are generally characterized by a soft, smooth, aerial tone, resembling the human voice. By the use of holes and keys, considerable compass is given to them; they are capable of producing only one sound at a time, but with considerable command of piano and forte. Of brass instruments the chief are the horn, trumpet, trombone, cornet-a-piston, euphonium, bombardon, and ophicleide. They are generally more powerful, and their quality more piercing than wood instruments; the ophicleide, however, approaching more than the rest to wood instruments in capabilities and tone. In a full orchestra there are generally two flutes, two oboes, two clarinets, two or four horns, and two bassoons, frequently with the addition of two basset horns, one or two piccolos, and one or two ophicleides or trombones. Each part, except when there is an unusually large number of bow-instruments, is single.

The organ is a combination of a large number of wind-instruments, sounded, not by the breath, but by the admission of air into the wind-chest, by means of keys pressed down by the performer.

WINDLASS is that modification of the wheel and axle which is employed in raising weights, such as bucketful of water from a well, coals from a pit, &c. Its simplest form is that of an axle supported by pivots on two strong upright pieces, and pierced near one end with four or six square holes, into which handles, known as *handspikes*, are inserted. In other forms, a winch at each end is substituted for the handspikes. If the weight (say a bucket of water) is to be lifted a considerable distance, the length of the rope which attaches it to the axle largely increases the weight, and thus aids the power when descending, and counteracts it when ascending. This difficulty is partially got over by employing a double rope with two buckets, one of which ascends while the other descends; but this modification, though partially effective for the end in view, lends aid to the power when aid is least, and hinders it when aid is most, required. A more efficacious plan is to form the axle not cylindrical, but of a barrel-shape, like two truncated cones placed base to base and to fasten two ropes, one to each end, so that when coiled up round

the barrel they approach the middle; in this case, when one rope is fully uncoiled, and winding-up commences, the gross weight, which is then at its maximum, acts at the minimum leverage of the end, and as the progress in winding up diminishes the weight, its leverage so increases that the momentum is preserved uniform. On the other hand, the empty bucket, when commencing its descent, acts at its greatest leverage, and as the unwinding of the rope adds to the weight, its leverage becomes smaller, so that the momentum of the descending weight always remains the same; and thus the strain on the power is preserved uniform. The ratio of the weight to the power it is sometimes found necessary to increase greatly; but with the ordinary windlass this could only be effected by similarly increasing the ratio between the leverage of the handle and the radius of the axle—an object attained by a great increase of the former, rendering the machine too cumbersome, or by greatly diminishing the latter, and so weakening it. The desired result is attained, however, in a manner not liable to these objections, by the use of the *differential axle*, an axle of which one half is of greater diameter than the other, and the single rope, after being coiled round the whole axle from end to end, is fastened at each end of the axle, and the weight is hung by a pulley, which is supported in a bulge in the centre of the rope. As the portion of the rope on one half of the axle is unwound, that on the other half is wound up; but since the rates of winding and unwinding are different, the bulge of the rope increases when the rope is wound on the smaller end of the axle, and decreases when it is wound off the smaller end. The more nearly equal the two radii of the axle are, the greater is the weight which can be raised by the power—the ratio between the two being

W ————— ; so that if the radius of the
radius of circle described by power
P — difference of radii of the portions of the axle
power is 18 inches, and the radii of the axle 5 and 4 inches, the power balances a weight = 18 times itself; while the strength of the axle requires to be only equal to that of one of the ordinary kind, in which the power can only balance a weight = 4½ times itself. The same principle is applied to the Screw (q. v.). For a very accurate estimate of the mechanical advantage of the windlass, the thickness of the rope must be taken into account, by adding half of its diameter to the radius of the axle.

WINDMILL is a mill for grinding corn, sawing wood, or performing any other species of work for which fixed machinery can be employed, the motive-power being the force of the wind acting on a set of sails in a manner similar to that of a current of water impinging obliquely on the float boards of a water-wheel. The structure is a conical or pyramidal tower of considerable height, and covered over at the top with a species of dome, which is so fastened as to revolve upon it round the upper extremity of a shaft, as a centre, the motion being aided by the interposition of "castors" between the wooden rings which form respectively the base of the dome and the top of the tower; the sails are attached to the extremity of the axle, so as to revolve in a plane at right angles to it, and the motion they communicate to the axle is transferred by bevelled wheels and to the upright shaft by which it is in turn conveyed to the working machinery at the bottom of the tower. The axis of the sails, which is inclined at an angle of about 10° to the horizontal, is fixed at one end to a projection from the top of the shaft, and at the other to a circular orifice in the side of the dome, so that it revolves with the latter, carrying the sails along with it; this arrangement is adopted for the purpose of enabling the plane of rotation of the sails to be placed always at right angles to the direction of the wind. This transference of the plane of rotation was at one time effected by manual labour applied to a winch at the bottom of the tower, the rotation being communicated, by an endless band and wheel-work above, to the dome, the outer circumference of the base of which, was, for this purpose, furnished with a circle of rack-work. But this clumsy arrangement was superseded in English windmills by an ingenious contrivance due to Sir William Cubitt, by which the wind itself was made to turn the sails into their proper position. The apparatus by which this is effected consists of a revolving *flyer* or *fan*, projecting from a gallery fastened to the dome on the side opposite to the sails; a long thin shaft to which a revolving motion is communicated by a toothed wheel on its outer extremity, from a corresponding wheel on the axis of the flyer,

and a pinion at the other end of the shaft acts upon the cog-wheel, which carries, on the lower extremity of its axis, a pinion; and this last can, at pleasure, be put into gearing with the rack-work or cog-circle on the lower edge of the dome. The sails are four in number. Each sail consists of a *whip* or radius of from 33 to 40 feet in length, firmly fastened at right angles to the sail-axis, and pierced at from 1-6th or 1-7th of its length from the axle to its extremity with about 30 holes, into each of which is inserted a cross-bar of 5-6 feet in length; and this framework, strengthened generally by light rods connecting the ends of the cross-bars, is then covered with canvas. The cross-bars, however, are not set in the plane of revolution of the whips, for, in that case, the wind, acting in a direction coinciding with that of the sail-axis, would impinge perpendicularly on the sails, and no rotatory motion would result; the bars, therefore, are set at an angle to this perpendicular direction, yet not all at the same angle, for the velocity of each point of the sail increasing with its distance from the sail-axis, the inclination must vary from the first cross-bar to the outer extremity. It is found that a variation of the angle from 18°, at the cross-bar, to 7° at the extremity, is a very effective form. The amount of sail that a windmill can carry with advantage is limited, according to Mr Smeaton (q. v.), one of the great authorities on this subject, to $\frac{1}{4}$ ths of the area of the circle described by one whip; the velocities of a sail, when unconnected with, and when producing its maximum effect on the machinery below, are as 3 to 2; also, the increase of useful effect varies with the square of the wind's velocity, and is proportional to the cube of the length of the whip, in sails of similar form. A windmill with sails of 40 feet radius is equivalent to 65,000 foot-pounds per minute. Another species of windmill, known as a horizontal windmill, is a large circular frame of wood which rotates on a vertical axis, and carries a set of sails which revolve in a horizontal plane. This form is, however, not nearly so effective as the other, it being evident that the wind can only act effectively on one sail at a time. According to Sir David Brewster, the power of a horizontal mill is only about one-third or one-fourth of that of a vertical mill, the number and size of the sails being equal in each. An ingenious form of horizontal windmill was patented by Mr Giraudat of New York in 1861. The peculiarity is in the sails, which are hinged in such a way that the force of the wind acting on one face of them preserves their perpendicularity to it, and secures a maximum effect, but when, after a further semi-revolution, the other side is presented to the wind, they are raised to a horizontal position. Most of the recent improvements in windmills have had for their object the regulation of the sail-area exposed to the wind to counterbalance the variations in the latter's force, and so produce uniformity of motion; but these are too numerous to be here noticed. We may mention, however, that the inventions, with this object, of Mr Bywater in England, M. Berton in France, and Mr Henry Glover of Massachusetts, are both ingenious and effective. Windmills were introduced into Europe from the Saracens, and were formerly much more extensively used in England than now. They are, however, still common in the midland and southern districts; on the continent, especially in Holland and France; and in the United States.

WINDOW (connected with *wind*, as Lat. *fenestra* with *ventus*) is an opening in the wall of a building for the admission of light and air. In the East, from time immemorial, windows open not upon the street, but upon the court, and are usually provided with lattices or jalousies. The Chinese use, instead of window-glass, a thin stuff varnished with shining lac, polished oyster shells, and thin plates of horn. Among the Romans, windows were originally closed with shutters; afterwards they were made of a transparent stone, *lapis specularis*, which, from the description, can be nothing else than mica; and in the 3d c. after Christ, of horn. According to some, there are traces of glass windows having been used in Pompeii; but the matter is doubtful. The first indisputable mention of glass windows is made by Gregory of Tours in the 4th c. of our era, who speaks of church windows of colored glass. Wilfrid (q. v.), on succeeding to the archbishopric of York in 669, filled the vacant windows of the cathedral with glass. In 674, Abbot Benedict Biscop brought artists from France to glaze the windows of the Abbey of Wearmouth; and the Bishop of Worcester did the same in 726. Leo III., in the end of the 8th c., put glass windows into the church of the Lateran. Glass began to be used in windows of private houses in England as early as 1180; in France in the 14th

century. As late as 1458, it struck Æneas Sylvius very much that in Vienna most of the windows were glazed. See GLASS.

In ancient temple architecture windows were unknown—the light being obtained from openings in the roof. In Gothic architecture, however, the window is one of the most important features, giving by the infinite variety of its outline, and the graceful forms of its tracery, as much character and beauty to the Gothic edifices, as the styles and colonnades of ancient art gave to the classic temples.

In the early Gothic or Norman style, the windows were small and comparatively stunted—they were either simple openings with semicircular head, or two such grouped together with a larger arch over both, and with the usual mouldings and ornaments of the style. The inside had generally a deep splay and simple moulding on the outside. Small circular windows sometimes occur in Norman work.

In the early English style the windows were more elongated, and had pointed arches. They are frequently grouped in twos or threes, and placed so close, that the wall between becomes a mullion. The wall over the group contained within the enclosing arch, then becomes perforated with a quatrefoil or other ornamental opening, and thus the simpler forms of tracery become introduced. The interior arches are splayed off, and are frequently very elaborately decorated with shafts and arch mouldings. The lancet window (so called from its shape) is common in this style. Circular windows are also used with tracery formed by little radiating shafts with small arches. The triangular window, on a small scale, is also occasionally to be met with.

It is in the Decorated style that the windows become enlarged and filled with mullions and tracery. This is at first simple, and composed of geometric figures such as the origin and progress of Tracery (q. v.) naturally led to. As the style advanced, more flowing forms were introduced, until, in the 15th c., the tracery passed into the Perpendicular Style (q. v.) in England, and into the Flamboyant (q. v.) in France. The heads of the lights, and the apertures in the tracery, are usually foiled, and the inner jambs are splayed and ornamented with mouldings, shafts, &c. In elaborately traceried windows, the jam and arch mouldings are occasionally very small, but they are usually bold and deep.

In the later Tudor style, the window-heads became flattened into the four-centre arch; and in the time of Elizabeth and James I., the arch gave place altogether to the flat lintel with the opening divided by mullions into rectangular lights, sometimes foiled at top. Circular windows, with elaborate tracery, are chiefly found in the Decorated period.

In domestic buildings, the windows are similar to the above, but square-headed windows occur more frequently to suit the height of the floors; and the space between the sill and the floor is recessed and fitted with seats. Trauoms are also of common occurrence. The Bow or Bay Window (q. v.) is also a frequent and very elegant feature in the later Gothic buildings.

In the revived Classic styles, the windows are almost invariably plain rectangular openings, with either a flat lintel or semicircular arch-head. They have sometimes architraves round the jambs and lintel, or are ornamented with pillars supporting an entablature or pediment above. The architraves are frequently carved, and the cornices carried on trusses at each side.

The style of shop-fronts has been much modified, and the windows enlarged, in consequence of the facilities afforded by the use of plate-glass.

WINDSOR, properly called NEW WINDSOR, a municipal and parliamentary borough of Berkshire, beautifully situated on the right bank of the Thames, 28 miles west-south-west of London. W. and Eton in reality form one town. The town is chiefly interesting on account of its being the scene of "The Merry Wives of Windsor," and the antiquity of its castle and parks, which have been a favorite residence of English monarchs, especially since the time of William the Conqueror. The elevated plateau of natural chalk upon which it stands marked it out, no doubt, as a naturally strong place from the earliest dates, but the deficiency of water which such a position entailed, was a serious objection to its being adopted as a permanent residence for many years. The older palace of the English kings was at Old Windsor, about two miles distant, and considerable doubt seems to exist among antiquaries and historians as to the first English king who built solid work of

masonry at Windsor Castle. In the time of Edward the Confessor it was probably a wooden structure, as stone was difficult to be had, and wood was abundant. William the Conqueror probably built the first substantial stone buildings, and regularly fortified the place; but the absence of water, except what was carried to it from the Thames, must have for a long time been a serious drawback to its importance as a military station. The history of the existing fabric begins in the reign of Henry III. The buildings may be said to be grouped in three portions—the Middle Ward containing the Round Tower; the Lower Ward, on the west, containing St George's Chapel, the houses of the Military Knights, cloisters, &c.; and the Upper Ward, on the east, containing the sovereign's private apartments. The unfinished chapel, which was begun by Henry III., was completed by Edward III., rebuilt by Henry VII., and added to by Cardinal Wolsey. Under this chapel is the burial vault of the present royal family. The Round Tower, formerly believed to be Norman, but in which there is not a single yard of Norman masonry, was built in the 18th year of Edward III. to receive the Round Table of the knights of the newly founded Order of the Garter. Pop. (1871) 11,769. The park and forest immediately adjoining are 18,000 acres in extent, and contain many historic trees, such as Elizabeth's Oak; Shakespeare's Oak; the Long Walk, made in the reign of Charles II.; and Queen Anne's Ride of Elms, three miles long. Herne's Oak, rendered so famous by Shakespeare, was blown down in Sept. 1863, and a stone and young tree now mark the spot. The oldest planted timber in England, viz., that of the reign of Elizabeth, is also in Windsor Park, and there are many oaks of which it is well established the age must be 1000 years.—See "Sat. Review," Aug. 11, 1866; Tighe's "Annals of Windsor;" Menzies' "History of Windsor Forest and Parks."

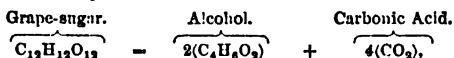
WINDWARD ISLANDS. See ANTILLES.

WINE, Chemistry and Manufacture of. Before entering into the chemistry of this subject, it is necessary that the composition of the grape, from whose juice it is derived, should be understood; and as there is an immense variety of vines yielding grapes of corresponding variety, and as the same variety* will, under different external influences, produce very different grapes, it is obvious that our researches must be confined to the most typical form of grapes. The principal component of the juice of ripe grapes is water, in which are various substances, either held in solution or very minutely divided. The juice as obtained by pressure, is thick, and exposure to the heat of the sun rapidly changes it into a fermented liquid. As principal components held in solution in the water, Professor Mulder mentions "sugar (both grape-sugar and fruit-sugar), gelatine or pectine; gum, fat, wax, vegetable albumen, vegetable gluten, and some other substances of the nature of extractive matters, which are not, however, accurately determined; tartaric acid, both free and combined with potash (as cream of tartar), partly also combined with lime; in some cases, we find also racemic acid, malic acid, partly quite free, partly combined with lime, and, according to some, tartrate of potash and alumina; further, oxide of manganese and oxide of iron, sulphate of potash, common salt, phosphate of lime, magnesia, and sillicic acid may also exist."—"Chemistry of Wine," p. 5. Although no other ingredients have as yet been discovered in grape-juice, others, which only appear during fermentation, and impart not only the vinous smell common to all wines, but the aroma (bouquet) and the flavor peculiar to each wine, must exist in it in small quantities. In those cases where the skins are allowed, as in the preparation of red wine, to ferment with the juice, the constituents imparting odor and flavor may be drawn from them. Coloring matter and tannic acid are undoubtedly found in the skin, and are thus imparted to red wines. Moreover, the grape-stones, which are left with the skins, yield tannic acid freely during fermentation. The different proportions in which the inorganic matters—the potash, soda, lime, magnesia, iron, manganese,

* A certain variety of grape, when grown upon the Rhine, furnishes a species of Hock; the same grape, when raised in the valley of the Tagus, yields Bucellas; whilst in the Island of Madeira it produces the wine known as Sercial, which has a flavor quite different from either of the others. See Miller's "Organic Chemistry," 8d ed. p. 187.

sulphuric acid, phosphoric acid, and chlorine—exist in grape-juice, exert a very great influence upon the quality of the wine, both in relation to its color and its taste. A relative excess of phosphoric acid, or of lime, or of soda, will induce changes sufficiently obvious to the chemist, but which we have not space to discuss. With regard to the acids of grape-juice, or *must*, as it is technically called, Professor Mulder observes that, as a general rule, the three—viz., tartaric, malic, and citric—are rarely found together in one fruit, and he doubts whether the presence of citric acid has been fully proved. Malic acid exists in unripe, and tartaric acid in ripe grapes; and while no malic acid exists in wine made from perfectly ripe grapes, a small quantity is present in most wines. In the article TARTARIC ACID, it is shown that a nearly allied acid, *racemic acid*, exists in exceptional cases in grapes. The quality of wine is only affected if this acid be largely present, because less lime than usual will be found in it, racemate of lime being less soluble than tartrate of lime, and further, because cream of tartar is more soluble than bi-racemate of potash. Such wines are consequently sweeter, and—if red wines—darker colored than wines containing only tartaric acid. The quantity of sugar varies extremely. In the juice of very ripe grapes, it may reach 40 per cent. According to Fontenelle, the juice produced in the south of France contains from 30 to 38 per cent.; while in the neighborhood of Stuttgart, Reuss determines it at from 25 to 33 per cent. In the low and variable temperature of Holland, the juice of the best grapes yields only ten or twelve per cent. of sugar. The composition of the albuminous matter is not clearly determined. In an analysis of the must of the Riesling grapes of Grumbach, Berlitz found that the gluten (no albumen was found) was thirty times less abundant than the sugar. It probably varies at from 1 to $\frac{1}{2}$ per cent. The only other ingredient requiring notice is fat, which is chiefly but not entirely derived from the grape-stones, in which it is an abundant ingredient. It occurs in wine, in minute quantity, in the form of a fatty acid.

On the subject of the fermentation of the grape-juice we shall only offer a few remarks. It has been already stated that the saccharine contents of grape-juice range from 13 to 30 per cent. If we regard all this sugar as grape-sugar, $C_{12}H_{22}O_{11}$, with an equivalent of 180, then each atom may be resolved into 2 atoms of alcohol, C_2H_5O , with an equivalent of 46, and 4 of carbonic acid gas, CO_2 , with an equivalent of 22, according to the equation—



provided that there is no loss; or under the most favorable conditions of fermentation, 180 parts (by weight) of anhydrous grape-sugar, or 198 of the hydrated sugar (with the formula, $C_{12}H_{22}O_{11}$), may yield 92 parts of alcohol; or, roughly speaking, 2 parts of sugar yield 1 of alcohol. "According to this," says Mulder, "the juice of French and German grapes give, when analysed, as a maximum, from 7 to 15 per cent. of alcohol by weight. But some of the sugar remains undissolved, and, during fermentation, more alcohol is evaporated than water; therefore, for such grape-juice, or rather for the wine to be produced from it, the alcoholic contents must be under 15 per cent. as maximum, and 7 per cent. as minimum."—*Op. cit.* pp. 49, 50. According to Mulder, sugar is found in all wine,* and its quantity depends to a considerable extent upon the treatment to which the grapes are subjected before pressure. Tokay wine, for example, is prepared from grapes which have been allowed not only to get over-ripe, but partly to dry on the vines; *vin de paille* is obtained from grapes dried on straw exposed to the sun; and in both these cases, water is evaporated, and the concentrated juice yields a wine of extra strength. The strong heavy wines used by the ancients were thus prepared. When the grapes are dried on the vine, the wine is called *vin sec*; and when the juice has been evaporated by the aid of heat, the wine is called *vin cotti*.

* Dr Bence Jones, in the Appendix to his translation of Mulder's work, declares, on the other hand, that while Port, Sherry (except in two instances), Madeira, and Champagne always contain sugar, Claret, Burgundy, Rhine, and Moselle wine (excepting one sample of Sauterne) are always free from every kind of sugar.

In consequence of the close connection which exists between the amount of sugar in the grape-juice and the excellence of the wine which it yields, attempts are often made, especially in bad seasons (want of heat and light, and excess of rain), to introduce extraneous sugar into the juice; or, as it is technically called, to *doctor* it. For this purpose, a cheap fermentable sugar is added to the sour juice, an adulteration which cannot subsequently be detected by chemistry, although it may be suspected, from the absence of the proper aroma from the wine. Similarly, sugar is often added to good grape-juice, in order to obtain a stronger wine than the natural product. Many imitations of Port wine are thus manufactured. The character of the wine is much influenced by the extent to which the process of fermentation is allowed to proceed. If it goes on till all the sugar is converted into alcohol, a *dry* wine is produced; when it is checked before the change is completed, a rich *fruity* wine is produced; and when the wine is bottled whilst the fermentation is still in progress, effervescent wine is formed.

Shortly after the must has passed from the wine-press, symptoms of fermentation appear; the juice becomes more turbid, bubbles rise to the surface, and a froth soon settles there. This process in a moderate climate usually reaches its highest point in three or four days; and before it is quite finished, the whole liquid mass is stirred up so as to re-excite the process. For this purpose, in many districts, a naked man used (we do not know if the custom generally still exists) to go into the wine-tub, who both accomplished the necessary stirring, and promoted fermentation by his animal heat. Several persons have been killed in this way by suffocation from the atmosphere of carbonic acid gas. In two or three weeks, the fluid becomes comparatively clear, and a precipitate forms at the bottom. The wine is now removed from the sediment into another vessel, and a slow form of fermentation—*after-fermentation*, as it is termed—goes on for several months, sugar being constantly converted into alcohol and carbonic acid, and a fresh precipitate forming at the bottom. Several similar changes into other vessels are made, to get rid of the sediment, till it is fit for transferring into casks. In order that the process of fermentation may go on satisfactorily, not only must water, sugar, and a nitrogenous matter in a state of actual change be present, but there must be also a certain temperature and a certain amount of atmospheric air present. "Although," says Mulder, "there is a wide interval between the extremes of temperature at which fermentation is possible, the boundary is very narrow which limits good and active fermentation in every kind of wine. The grapes of each country ripened under different degrees of summer warmth, and very unequally rich in constituents, require very different temperatures during fermentation; and different temperatures are also required for grapes which are the product of a warmer or a colder summer. But on these points we have little accurate knowledge. All we know is, that a high temperature during autumn promotes fermentation and a low one is detrimental to it; and that inequality of temperature during fermentation is extremely injurious, and not unfrequently spoils the wine altogether."—*Op. cit.*, p. 61. To what extent it is expedient to admit atmospheric air to the must, so that the fermentation may go on most favorably, is a point regarding which there has been much discussion, and which is not definitely settled. While some have asserted that no air is necessary to the development of fermentation, others have maintained that the wine is improved by the free admission of air during fermentation. Gay-Lussac proved experimentally that air is essential to facilitate fermentation, which would then be continued without any fresh supply; and for many years wine was made in France with an almost total exclusion of air from the fluid by an arrangement intended to prevent the escape of alcohol by evaporation; but when the same chemist proved that by the use of open vats scarcely 1-200th part of the alcohol was lost, this arrangement fell into disuse. Judging from the method of preparing Bavarian beer, in which air is allowed to enter freely, Liebig recommended the same in the case of wine, and suggested that a large opening should be made in the casks in which fermentation takes place. This method has been tried on a large scale by Von Babo, Crasso, and others, with red wine, which was found to be of a better quality than that which underwent the same process in a cask which was closed, and only provided with a glass tube for the escape of the carbonic acid. But in other experiments made with white wine, the wine in open casks appeared to lose in aroma; and hence the solu-

tion of this question apparently depends on the kind of wine. Liebig's opinion has been very fiercely, and, as Mulder thinks, unfairly attacked; the probability is, that wines containing much sugar may be allowed with advantage to ferment in closed vessels, while those less rich in that substance may be left in open casks, provided the temperature be low and equable. When the main object is to increase the quantity of alcohol, the admission of much air is injurious, since it promotes the formation of acetic acid, and causes a corresponding loss of alcohol.

The actual substance—*ferment*—which causes the breaking-up of sugar into alcohol and carbonic acid, has been submitted to careful chemical and microscopical examination. One hundred parts of sugar require about 1.5 parts of ferment reckoned in the dry state; and as the analysis of ferment shews that about half of it consists of albuminous matter, it follows that $\frac{3}{4}$ of a part of albuminous matter are required for the conversion of 100 parts of sugar into alcohol and carbonic acid. Ferment consists of cells or globules of *Torula* (q. v.), which are precisely the same in the production of wine and beer. It is the contents of these cells which contain the active albuminous matter; while the cell-wall, consisting of cellulose, $C_{12}H_{10}O_{10}$ and produced from gum or vegetable mucus, is inert.

The leading points in which the constituents of grape-juice and those of wine differ from one another in consequence of fermentation, are, that in the wine there is a diminution (1) of the mucilaginous and saccharine matters, in consequence of the formation of ferment and alcohol; (2) of those substances which are insoluble in common water, but are held in solution in the viscid must as, for example, phosphate and sulphate of lime; and (3) of cream of tartar tartrate of magnesia, and sulphate of potash, which, being less soluble in spirit than in water, fall as the formation of alcohol increases. Red wines lose a portion of coloring matter and of the tannin, which is withdrawn by these salts, and hence become of a lighter color and less astringent. Before noticing the alcoholic strength of different wines, we shall briefly describe the concluding steps necessary for rendering wine fit for use. The process of *clearing* is undertaken with the view of removing all the sediment in which albuminous matters may still occur, and of diminishing the coloring matter and tannin of red wines. Amongst the substances used for these purposes may be mentioned albumen, isinglass, gum, milk, lime, gypsum, &c. In warm countries, gum is preferable to albumen or isinglass. The addition of lime throws down a precipitate of salts of lime, which carries down, in the case of red wine, a considerable quantity of coloring matter; its addition gives a sweeter and less astringent taste to the wine, and an appearance of age. As a general rule, clearing increases the durability of wine. *Sulphurising* is a process which is especially applied to sweet white wines, which possess an excess of sugar and albuminous matter and little tannic acid, and thus become easily decomposed. Its object is to check undue fermentation, and to prevent the formation of mould, which afterwards imparts a musty taste to the wine. The process is effected by burning sulphur in bottles or casks, and instantly pouring in the wine, which absorbs the sulphurous acid. Wine intended for exportation to warm climates is usually strongly sulphurised. Of course, great care must be taken that the sulphur is free from its common impurity, arsenic. In place of sulphurising, another method of hindering the fermentation of sweet wine is adopted in some parts of France; it consists in putting 1—1000th part of powdered mustard into the wine; but how it acts is unknown.

Having traced the chemical history of wine from its original state of grape-juice to the time when, having been clarified, and poured into casks and bottles, it is fit for use, we ought, in order to complete the sketch, to notice the subsequent changes which, in the course of time, it undergoes in the cellar. The ages at which different wines attain their perfection are, as is well known, extremely different. "As a general rule," says Mulder, "wines which have retained a considerable portion of albuminous matter, and possess but little tannic acid, cannot resist the influence of time; they become acid, or undergo some other change. This occurs in the case of Rhine wines, which contain but little alcohol; and all those wines which contain much sugar, or but little tannic acid, cannot be kept long. Wines which can be *cellared* are those which improve; or, to speak more correctly, those wines are stored which improve with age. In these, odoriferous substances are formed, and the wine becomes less acid and better tasted. Such wine as is colored often deposits a considerable amount of sediment; and if it be stored in casks, there is a constant increase of alco-

hol."—*Op. cit.*, pp. 105, 106. Wine is improved by being kept in wooden casks, as water escapes by evaporation, and the other constituents are relatively increased. The vinous constituents being thus concentrated, exert a stronger chemical action upon each other, and render the wine not only stronger, but better flavored. The change, however, does not stop here. The loss of water must be replaced by the addition of wine, otherwise the action of the air would turn the wine sour, and convert the alcohol into acetic acid; and the diminution of water, which is thus replaced by wine, causes a constant increase of tartaric acid. Wines which are poor in sugar may thus soon become too sour; and consequently, all wines cannot undergo this process. The popular idea, that wine which has grown old in bottles has therefore become richer in alcohol, is altogether false, and is doubtless founded on the fact, that it is only the strongest wines that can be preserved. The color, however, of bottled wine is materially affected by age: liqueur-wines and red wines containing no large amount of tannic acid, becoming darker, while wines which are rich in tannic acid, as Port, for example, deposit a sediment, and become lighter. Old bottled wines contain odoriferous constituents—ethers of various organic acids—which are not found in new wine. For an explanation of the mode of formation of these compounds, to which wine owes its *aroma*, we must refer to the chapter on "The Odoriferous Constituents of Wine," in Mulder's work; we will here merely remark, that diminution of the free acids is necessarily associated with the formation of these compounds, and that this diminution can only occur by the acids being either decomposed or combined with non-acid substances, both of which operations here take place as the result of a very slow chemical process. This effect of time may, however, be imitated by art; and if bottles corked, but not quite filled with wine, are placed for two hours in warm water at a temperature of 153°, and after cooling are filled, their contents possess the flavor and aroma of wine that has been bottled several years. This result was originally obtained by Appert; but Pasteur and others have, during the last few years, again brought the subject before the French Academy. Wines which have been long in bottle sometimes acquire a peculiar flavor, which is incorrectly referred to the cork. It is in reality due to the peculiar mould which grows from the outside of the cork inwards; and should it reach the inner surface, it imparts to the contents of the bottle a peculiar taste; and this wine is said to be *corked*. Very similar to this is what is sometimes known as "the taste of the cask," a peculiar flavor sometimes acquired by wine before bottling. This flavor is regarded as dependent on the development of a peculiar essential oil, during the growth of "mould," on the surface of wine. It can be removed by the addition to each pipe of about a quart of olive oil, which dissolves the unpleasant flavoring matter, and carries it to the surface.

In submitting matured wines to chemical analysis it is found that they differ materially from one another in their composition; and especially as the wine is, or is not, red. In white wine, no special coloring matters are found, and only a trace of tannic acid; while in red wine, both are present. In wine generally, the principal ingredients are alcohol and water; then sugar, gum, extractive and albuminous matters; then free organic acids, such as tartaric, racemic, malic, and acetic acid; and salts, such as the tartrates of potash, of lime, and of magnesia, sulphate of potash, chloride of sodium, and traces of phosphate of lime; also, especially in old wines, substances imparting aroma, as cænanthic and acetic ethers, and other volatile odoriferous matters (amongst which Mulder mentions butyric and caprylic ethers, each having a pine-apple odor, caproic, pelargonic, capric, and propionic ethers, amylic alcohol, and many of its ethers and other compounds, aldehyde, acetal, and probably racemic, citric, and malic ethers). In red wines, and in many others, a little iron, and possibly some alumina, may be found; and lastly, the best wines contain, according to Fauré, a peculiar matter, which he terms *cænanthin*, and to which he ascribes the substance or body of the wine; but which seems to other chemists scarcely to differ from gum or dextrine. These ingredients, as Mulder observes, vary exceedingly in proportion. The quantity of some is so small that the substance almost disappears during analysis; others can just be determined by a delicate balance; while others, again, are freely present. Putting aside taste and smell as standards of comparison, most of the essential dietetic and therapeutic properties of wine depend upon the *alcohol*, *sugar*, and *free acids*, especially *tartaric acid*, contained in it. In his chapter on "The Amount of Alcohol in Wine," Mulder

gives a large number of analyses of different wines in which the percentage of alcohol is determined. We shall here only give the abstract of the analyses made by his translator, Dr Bence Jones, who found that the alcohol varies in

		Per Cent.		Per Cent.
Port.....	from	20.7	to	23.2
Madeira.....	"	19.0	"	19.7
Sherry.....	"	15.4	"	24.7
Champagne.....	"	14.1	"	14.8
Burgundy.....	"	10.1	"	13.2
Rhine Wine.....	"	9.5	"	13.0
Claret.....	"	9.1	"	11.1
Moselle.....	"	8.7	"	9.4
while in				
Brandy.....	there was	50.4	"	53.8
Rum.....	"	72.0	"	77.1
Geneva.....	"	42.4	"	
Bitter Ale.....	"	6.6	"	12.3
Porter.....	"	6.5	"	7.9
Cider.....	"	5.4	"	7.5

Sugar is found in all wines,* although in certain kinds very little exists. According to Fresenius, the sugar in four kinds of Rhine wine amounts to exactly six-sevenths of the extract remaining after evaporation, the seventh part consisting of the salts and non-volatile unfermentable matter. In red Bordeaux, on the other hand, very little sugar is found; red Sauterne contains less than 1 per cent. of extract, and Hermitage 1.7; hence the quantity of sugar must be very minute; while some kinds of Muscat yield 21.5 of an extract, containing about 22 per cent. of sugar. Small as is the quantity of sugar in some wines, it is of great importance in diminishing the sharp taste of the free acids, and in imparting an agreeable flavor to the wine. Good red wines should contain at least one-half per cent. of sugar, and the quantity is sometimes larger. Some of the sweet wines contain nearly one-fourth of their weight of saccharine matter.

The following results were yielded by the experiments of Dr Bence Jones:

Sherry (13 samples), sugar in 1 oz. varied from 4 to 18 grains.			
Madeira (9 samples).....	"	"	6 to 20 "
Champagne (4 samples).....	"	"	6 to 28 "
Port (3 samples).....	"	"	16 to 34 "
Malmscy Madeira.....	"	"	56 to 66 "
Tokay.....	"	"	74 "
Cyprus.....	"	"	102 "

Under the term "free acids" are included the acid tartrate of potash, known as cream of tartar, and other soluble bitartrates found in wine, besides such acids as are quite uncombined, such as tartaric, malic, and acetic acid, and a trace of free tannic acid. Sugar has so much power in concealing the free acids, that their amount cannot be estimated with any certainty by the flavor of the wine, and must be estimated chemically by ascertaining how much of an alkaline solution of given strength must be used in order to render a given quantity of wine perfectly neutral to test-paper. Volatile acids, as, for example, acetic acid, may either be determined separately, or included with the others; and, excepting this acid, all the other acids occurring in wine may practically be calculated as tartaric acid. Mulder found that acetic acid was present in 20 different kinds of wine which he examined, the amount of the anhydrous acid ranging from 1.75 thousandth parts in Madeira to 0.25 thousandth parts in Taveila. In the same 20 kinds of wines, the free tartaric acid ranged from 2 to 7 parts in 1000 of wine, Taveila having the largest, and Bordeaux Sauterne the smallest quantity. With regard to the tannic acid, traces of it may be found in all white wines, but so no white wine is it sufficiently abundant to be of the slightest importance in a med-

* In the preceding foot-note we have mentioned that Dr Bence Jones denies the accuracy of this statement.

ical or dietetic point of view. On the other hand, it is abundant in Port and heavily loaded Bordeaux wines, especially when new. In the course of time, this tannic acid becomes oxidised into a sparingly soluble compound, which is called by Berzelius the *apothema*, or precipitate of tannic acid—a process which is facilitated by the exposure of the wine in bottles to full daylight. There is no doubt that this acid, by combining with the albuminous matters, tends to increase the durability of these wines. Dr Beuce Jones, in his Appendix to Mulder's treatise, gives numerous results of experiments made regarding the acidity of wines by Prout, Liebig, Fresenius, and himself. His general conclusions are, that, "proceeding from the least acid wine to the most acid, we have Sherry, Port, Champagne, Claret, Madeira, Burgundy, Rhine wine, Moselle. The least acid fluids examined were Geneva and whisky; then rum, brandy, ale, porter, stout: the wines were all more acid than the malt liquida." Mr Griffin has made twenty-two determinations of the acidity of light wines for Dr Drullit, which are published at the end of that physician's instructive little work on "Cheap Wines," and has subsequently published an independent volume on the mode of determining the acidity of wines.

In conclusion, we may say a word or two on "the diseases of wine," by which term we understand those conditions in which the wine has become so altered and unfitted for use as to have lost its distinct character. The most important of these diseases are:

1. *The Turning of Wine.*—This disease is incidental to young wine, and seems to occur under special conditions of the weather. The color becomes darker, and the taste first disappears, and if the disease goes on, becomes disagreeable; the wine becomes turbid and acid. This disease is caused by a decomposition of tartar.

2. *The Ropiness of Wine.*—This disease consists in the formation of vegetable mucus from the sugar of the wine, and is known as mucous fermentation. The wines liable to this change are those which are deficient in tannic acid.

3. *The Bitterness of Wine*—to which Burgundy wines are especially exposed—seems due to a second fermentation, inasmuch as a large amount of carbonic acid is evolved. It has been ascribed, whether correctly or not, we cannot say, to the formation of citric ether, which is very bitter. The disease is caused by the sediment, and often ceases on being drawn off into other casks.

4. *The Acidifying of the Wine* depends upon the conversion of the alcohol into acetic acid, and may be stopped at its commencement by adding alkaline carbonates, which, however, destroy the color, and affect the taste of the wine.

5. *The Mouldiness of Wine* is a disease in which mould-plants are produced on the surface of the wine. How or under what conditions the mould is formed, is not known, except that the admission of air is no doubt favorable to the disease.

For further information on this subject, we may refer, *inter alia*, to Henderson's "History of Ancient and Modern Wines," Beuce Jones's translation of "Mulder's 'Chemistry of Wine,'" and to the recent works of Shaw and Denman, in English; to those of Julien, Chaptal, Fauré, (1844), and Bailliat, in French; and to those of Ritter, Balling, Von Babo, Brouner, &c., in German; also to the chief works on technological chemistry in all languages.

Manufacture.—The mode of manufacturing wine varies in its details in different countries. Pagnierre, in his treatise "On the Wines of Bordeaux," gives the following description of the manufacture of the superior clarets. The grapes, after being gathered, are picked; all that are likely to injure the quality of the wine being carefully removed. A principal vat of the best fruit, which is called the mother-cask (*cuvée-mère*), is then made, into which, after picking, the workmen continue to put the best grapes, without their stalks, and without treading them, till they are from 15 to 20 inches deep after which they throw about two gallons of old Cognac or Armagnac upon them, and then another bed of picked grapes, followed by two gallons more of brandy, and so on till the vat is full. Spirit of wine is then added, about four gallons being used for a wine-vat of from 30 to 35 tuns. The amount of brandy and spirits that is added varies with the quality of the vintage, the better vintages requiring the less spirit. When there is a deficiency of saccharine matter in the grapes, starch-sugar is sometimes added. The *cuvée-mère*, when filled, is closed and well covered with blankets to prevent the entrance of air, and is left in

this state for about a month. A small cock or tap is placed in the side of the vat to about a third of its depth from the bottom, in order to allow of the progress of fermentation being observed; and to enable the manufacturer to know when the wine, having become cool and sufficiently clear, may be racked off and put into casks, previously prepared by scalding and rinsing with a little spirit. While the *cuvée-mère* is at work, the ordinary vintage goes on as follows: The grapes are trodden or acted on by machinery in the press, and put with their stalks into the vats, when the fermentation takes place naturally. About a foot of the upper part of the vat is not filled, in order to leave space for the fermentation, which in very mature vintages sometimes occasions an overflow of these limits. The term *chapeau* is applied to the floating mass of stalks, seeds, and skins on the surface. The vats are lightly covered, and in from a week to a fortnight the wine is ready for being drawn off; for if it is left upon the lees (*marre*), or in contact with its crust (*chapeau*), it would take the disagreeable taste of the stalks. The barrels in which it is then placed are filled to about two-thirds or three-fourths after which the *cuvée-mère* is emptied, and its wine is poured in equal portions into these casks so as to fill them; and the remainder is used to replace every week what is lost by evaporation, or may have leaked away. All proprietors have not the means of making a *cuvée-mère*; but in its absence, and with the employment of small vessels, wine of an inferior character is produced. The casks being full, are left unbunged for about a week, a bung-hole being in the meantime covered with a brick or piece of wood. They are filled up every two days, and after bunging, at least once a week, till the wine is in a state to allow the cask to rest with the bung-hole at the side, which is not till after a year and a half.

White wines are made in a somewhat different manner. The grapes are not, as in making red wine, put into the vat to ferment, but after the removal of the stalks, they are trodden, and when taken from the press, the juice, skins, and seeds are put into casks, in which the fermentation takes place, and wine is formed. When the fermentation has ceased, the wine is racked off from the barrels into smaller casks; and any loss that subsequently occurs from evaporation must be replaced once or twice a week.

The nature of the wine-press possesses many modifications. The wine-presses of the Jews consisted of two receptacles, or vats, placed at different elevations, in the upper one of which the grapes were trodden, while the lower one received the expressed juice or must (see Joel iii. 13). These vats were usually hewn out of the solid rock (Isa. v. 2 (margin), and Matt. xx. 83). In Wilkinson's "Ancient Egyptians," vol. i. p. 48, there is a figure of a wine-press thus composed of two vats or receptacles. The process of treading, which seems to have prevailed from the earliest ages, is shown in that figure, the traders being assisted by ropes fixed to the roof of the press. A certain amount of juice was allowed to exude from the ripe fruit by its own pressure before the treading began. This was kept separate from the rest of the juice, and formed the *gleucus*, or "sweet wine" noticed in Acts ii. 13. The first drops that reached the lower vat were called *dema*, or tear, and formed the first-fruits of the vintage, which were to be presented to Jehovah (Ex. xxii. 29). Although the ancient system of treading the grapes still prevails in many countries, it is being gradually displaced by various mechanical appliances. In some parts of France, two wooden cylinders turning in opposite directions are employed to crush the fruit; and the reader will find accounts of more complicated presses in the various works on wine by Cyrus Redding and later authors.

Commerce.—The manufacture of wine has been carried on in all countries where the grape could be successfully cultivated, from the very earliest periods of history; and during the present century it has followed the footsteps of man, and become established in the American and Australian continents, and promises to become, especially in the latter, a most important introduction. The vine, like most cultivated plants, is capable of producing very numerous varieties, and these, of course, give rise to different qualities of wine; but far more influence is exerted upon the quality of the wine by climate, soil, and the position of the vineyard as to the sun's influence; so that we not only have wines peculiar to particular countries, but of those, again, we have usually very numerous varieties, produced by special causes within those countries; and in addition to all these, again, we

have other differences, produced by the degrees of skill in the manufacture. The earliest wines of which we have any account were made in Asia, but of these we know very little. Later on, we find abundant evidence of the high esteem in which wine was held by the Greeks, Romans, and other civilised contemporary nations; and the name of one of the choicest Roman wines has continued in use to the present time, viz., the Falernian. From what we learn from Pliny and other writers regarding the extraordinary additions made by the Romans to their grape juice, and the treatment of the interior of their casks, we should much doubt whether even Falernian would be appreciated by the English palate. The following extract from the article "Vinum" in Smith's "Classical Dictionary" will give a notion of the way in which the ancients "cooked" their wines: "The principal substances employed as *conditura* or seasonings were—(1) sea-water; (2) turpentine, either pure or in the form of pitch (*pitx*), tar (*pitx liquida*), or resin (*resina*); (3) lime, in the form of gypsum, burnt marble, or calcined shells; (4) inspissated must; (5) aromatic herbs, spices, and gums; and these were used singly or cooked up into a great variety of complicated confections. It was customary to line the interior of both the *dolia* or casks, and the *amphoræ* or pitchers, with a coating of pitch; but besides this, it was customary to add this substance, or resin, in powder, to the must during the fermentation, from a conviction that it not only rendered the wine more full-bodied, but also communicated an agreeable bouquet, together with a certain degree of richness or piquancy (Pliny, 'N. H.' xiv. 25; Plutarch, 'Symp.' v. 3)." The modern Greeks, it is said, use turpentine or resin in the preparation of their wine, as their ancestors did two thousand years ago. Most Sicilian wines (the ancestors of the Sicilians were Greeks) have a decided resinous taste, as have also the Cape wines. The medieval history of wine is involved in much obscurity; but we find such abundant mention of Sack and Canary, that although we are not quite clear as to the exact history of those wines, we are not left in doubt as to the high appreciation felt for them by the priesthood and nobility of those times. The Greek islands seem to have furnished a large portion of the wine then consumed in Europe; and the Malmsay of those times was not the produce of Madeira, but of the islands of Tenedos, Lesbos, Chios, and Candia. At a later period the Burgundy Wines (q. v.) of France and the Rhine-wines (q. v.) of Germany became famous, and may be regarded as the commencement of that vast commerce which has now spread all over those countries, and has led to such variety and perfection, in the manufacture of this valuable drink. It is beyond the limits of this article to give even a full list of all the known varieties of wine, much less to specify their peculiar qualities. The chief wines of France and Germany are noticed under the heads of Bordeaux (known in England as Claret), Burgundy, Champagne, and Rhine-wines (see also HOCHHEIM and MOSELLE). There are very choice sparkling wines made in Germany of both the Rhine (or Hock) and Moselle classes; the Moselle wines have hitherto been artificially flavored either with musk or with elder-flowers, to imitate the flavor of the Muscat grape. At first, it was carefully and judiciously done, but is now often carried to excess.—Hungarian and Austrian wines have lately come into notice in Britain, and the former have found much favor with some consumers. But although Hungary produces the Tokay (q. v.), which, if genuine and old, is scarcely rivalled in the world, yet the wines commonly used are inferior in many respects to the ordinary wines of France and Germany, which they most resemble. The best known are Carlowitz, St George, and Odenburg—white; and Erlauer, Ofner, Menes, Buda, and Grosswardein—red wines. The best Austrian wines are those of Steinberg, Vö-lan, and Goldeck—red and white of each; also an effervescing wine somewhat like Sparkling Burgundy, called Sparkling Vö-laner.

The wines of Spain and Portugal are in the highest esteem in Great Britain—those of the former country best known under the general name of Sherry (from Xeres), and those of the latter as Port (q. v.). The Spanish and Portuguese wines, like those of other countries, differ widely in quality. The highest class of sherries are those which are technically called *dry*, that is, are free from sweetness. The Montilla, Manzanilla, Amontillado, and Vino de Pasio, are of this kind. Some red wines are also made in Spain, as the Tinto or Rota Tinto, Pazaré, Val de Peñas, Benicarlo, &c. The produce of Spain is enormous, being estimated at nearly 186 millions of gallons.

About the middle of the last century, Port, or the wine of Portugal, became the most important wine for British use, and for the highest qualities, very high prices have always been given; indeed, such is the demand for very old wines of the best vintages, that as much as £35 per dozen bottles, or £17 10s. per gallon, was realised at a sale for Port wine of the year 1830, not many years ago. This is probably the highest price ever reached for Port; but on the continent, the finest Tokay has realised even more than £36 per dozen at Cracow. Besides Port, we receive from Portugal Bucellas and Lisbon, white wines; and Colares and Calcuvela, red.

The Italian wines are very numerous. The best *reds* are Lambrusco, Barbera, Barolo, Brachetto, Grignolino, Aleatico, Brollo, &c.; the best *whites*, Malvasia, Vino Santo, Lichryna Christi, Vernacchia, &c. Of *sparkling* wines, the Red and White Asti, Passeretta, Nebiolo, and one or two others, are very good. They differ much from the sparkling wines of other countries in being much less effervescent.

The chief Greek wines are those of Candia and Cyprus, but not much of either comes to Great Britain.

Madeira was long famous for its fine white wine, but the almost total destruction of the vines by the fungous growth known as the oldmild, and causing the grape disease, temporarily stopped the trade. It is, however, beginning to revive.

From the Cape of Good Hope, very large quantities of inferior wine are sent to Europe, and sold as Sherry. The Red and White Constantia of that colony are, however, excellent sweet wines, of a very luscious character.

The United States of America have begun to grow the vine extensively, and to produce wine. At present, it has all been used for home consumption. The most celebrated is the Catawba, and is a very good imitation of Champagne.

The Australian colonies have also commenced wine-making, and have produced very fair qualities; the best is a Hock-like wine, called Cwarra.

Owing to the very fine produce of two small vineyards on the banks of the river Yalta in the Crimea, belonging to Prince Woronzov, the Russian government established a School of Wines in the Crimea, but with very indifferent results, as the efforts of this establishment have been to imitate the wines of other countries, instead of producing distinctive ones of their own locality. The wines of the Prince Woronzov are great favorites where known: the finest is called Al Dauli; the second, Massandra; and the third, Muscat. They are light white wines, of a most agreeable flavor, and fine golden-yellow color.

The following, taken from the annual government returns, will shew the vast commerce carried on in this article of trade. Wine imported into Great Britain in 1865, 14,368,732 gallons, value, £3,914,196; in 1875, 18,472,406 gallons, value £6,820,679.

Dietetic and Medical Value of Wines.—It may be laid down as a general rule, that the use of wine, even in moderate quantity, is not necessary for young or adult persons enjoying good ordinary health, breathing fresh country air, and not exposed to overwork or any other abnormal depressing agency. As, however, life advances, and the circulation becomes languid, wine in moderation becomes an essential, or, at all events, a valuable article of food; and even in earlier life, the physician meets large numbers of townspeople, especially women engaged in sedentary occupations, who cannot digest the national drink, beer, which is admirably suited to our outdoor laboring population, and to persons of higher rank who indulge freely in open-air exercises. In such cases, the beer is replaced by the more grateful beverage, tea, which, however, when taken too freely, and without sufficient solid food, gives rise to a form of distressing dyspepsia, which too often impels the sufferer to seek refuge in spirits. In many such cases, cheap wine, which may be purchased under our new tariff at from 1s. 6d. to 2s. a bottle, mixed with an equal bulk of water, will be found an excellent substitute for the beer or tea. We shall first notice the medical uses of those numerous cheap French, German, and Italian wines which have been, during the last few years, so prominently brought before the attention of the British public by certain enterprising wine merchants; and then briefly notice the uses of the more expensive wines, such as Port, Sherry, Champagne, &c. In the first department of the subject, we shall take Dr Drutt's "Report on Cheap Wines" as our chief authority, and we shall regard as chief wines those whose price does not exceed 2s. 6d. a bottle. In prescribing wine, whether cheap or dear, the physician desires to give not merely alcohol, for that

might be given far more cheaply under the form of gin or British brandy, but a compound liquid containing not only more salts or mineral ingredients than many a mineral water, but also the extractive parts of grape-juice, and the powerful oils and ethers which give to wine its special flavor or bouquet, and its singular exhilarating properties. "The distinctive elements of wine," says Dr Drutt, "are to be had in abundance in cheap Bordeaux, Burgundy, and other French wines; in Rhine wine; in the Hungarian, Austrian, and some Greek wine; and in all with a natural and not injurious quantity of spirit. In prescribing *pure wine*—i. e., light natural, virgin wine—the practitioner has a perfectly new article of both diet and medicine in his hands."—*Op. cit.*, p. 22. In cases of debility and indigestion, such wine as that which we are now considering, diluted with cold water, may often be freely prescribed with great advantage in place of tea at breakfast, as well as at luncheon or dinner, or dinner and supper, according as the patient arranges his meals. The best of the cheap wines are those of Bordeaux; they are pure, light, and exhilarating; moderately strong, seldom containing 20 per cent. of alcohol; free from sugar and other materials likely to induce gout or headache; and are admirably adapted, according to Dr Drutt (who has experimented largely upon them), for children with capricious and bad appetites, for literary persons, and for all whose occupations are chiefly carried on indoors, and which tax the brain more than the muscle. They should be taken *at*, not *after*, meals; and in many cases, when judiciously prescribed, they will be of more service to persons suffering from anæmia, chlorosis, dyspepsia, or gouty or rheumatic tendencies, than any form of medicine. The Bordeaux wines are, moreover, of great use in relieving the restlessness, nightly wandering, and thirst that accompany scarlet fever and measles in children; one part of wine with one or two of cold water, according to age, being an excellent drink, acting at once as a diaphoretic, saline, and sedative. The Burgundy wines are fuller, stouter (on an average, from 2 to 4 per cent. stronger in alcohol), and higher flavored than the Bordeaux of equal price. The cheap Burgundies are inferior to the Bordeaux as medicinal agents; but the higher-priced wines (at and above 4s. a bottle) are of extreme service in cases of nervous debility with nervous exhaustion, and as Dr Drutt remarks, "what Bordeaux is to the blood, that is Burgundy to the nerves." Some of the Hungarian wines which are being now introduced into this country, are excellent substitutes for Bordeaux; and not having the acidity, austerity, and coldness of the latter, are often preferred by patients. Amongst the most important of the *dearer* kinds of wine are Port, Sherry, and Champagne. Good old Port is a tonic of great value in cases of fever and other forms of extreme debility; but many persons past 40 dare not take it if they have any predisposition to gout. Port wine given with warm water, administered with a biscuit at bedtime, often induces a good night's rest during convalescence from fevers or other weakening diseases. But during the last 20 or 25 years its price has risen from 20 to 100 per cent.; and the Port purchased at a vintner's by a poor invalid at 4s. a bottle is usually nothing but doctored British spirit that has been sent to Hamburg to be transmuted into wine. In place of good Port, now unattainable by the poor, the physician had better prescribe good British brandy, if a strong stimulant be required; or such wines as the Hungarian Osner or French Madeira, if it is the nutritive value of wine that is required. Sherry is, in a dietetic point of view, the wine in most general use in this country, and if pure, it agrees well with most constitutions. It is the only wine admitted into the Pharmacopœia, in which it is employed in the composition of aloetic, antimonial, colchicinn, and other medicated wines. It is a wine that suits the stomach in many cases of dyspepsia, but is not often prescribed medicinally. Champagne is a wine that acts as a most valuable medicine in cases of vomiting, irritable stomach, &c., and when the appetite flags, and there is great general debility. Geniine Tokay is so rare a wine that it is almost unnecessary to notice it; it is, however, when procurable, extremely valuable as a cordial for aged persons of broken-down constitution.

WINNIPEG, Lake, the largest of the lakes belonging wholly to British North America, lies 20 miles north of the state of Minnesota, and about 550 miles northwest of Lake Superior, in lat. 50°—54° n., 96°—100° w. It is 264 miles long, 35 miles broad, has an area of 9000 sq. m., and lies 628 feet above sea-level. It is connected by navigable channels with Lakes Winnipegos and Manitoba, which lie to the west,

and run almost parallel with it. Its tributaries drain an area of 400 000 sq. m. Of these, the largest is the Saskatchewan (q. v.) which flows eastward from the Rocky Mts. through a rich alluvial country, and joins the lake near its northern extremity. The Winnipeg River, 800 miles long, and flowing in a north-westerly direction, connects Lake W. with the Lake of the Woods and Rainy Lake. The Red River and its great branch, the Assiniboia, discharge their waters at the southern extremity of Lake W., after flowing through the region to the south and south-west—a region which presents a singular and important combination of prairie and woodland, looking, in many places, like the result of careful culture. Other affluents of the lake, of smaller size, and watering a region incapable of supporting any considerable population, flow from the east. Nelson's River, issuing at the north end of Lake W., is its principal outlet: it flows into Hudson's Bay near York Factory, and forms a great highway of communication between Hudson's Bay and the territory north and west of Lake W.

The basin of Lake W. and its tributaries may be considered as forming the new province of Manitoba. The access to it from Lake Superior lies through a rugged country. There is, however, a prospect of a railway being soon constructed to connect the present Canadian system with the Pacific, running through the heart of the province, and opening up its immense agricultural and mineral wealth.

WINNIPISCIOGEE, or Winnepesaukee (the latter being the usual pronunciation), a beautiful lake of New Hampshire, U. S., 25 miles long, by some 10 miles wide, but extremely irregular, with deep bays, bold promontories, and numerous islands from a few yards to many acres, with water clear as crystal, stored with fish, and surrounded with hills and mountain peaks. It is navigated by a steamboat, and is a favorite resort of tourists to the White Mountains.

WINSEY, or Winsey, a cloth of Scotch manufacture, consisting chiefly of wool mixed with a portion of cotton.

WINTER GREEN, the popular name of plants of the genera *Pyrola* and *Chimaphila*, of the natural order *Pyrolaceae*, which, according to some botanists, is a sub-order of *Ericaceae*, distinguished chiefly by difference of habit, but also by declinate styles, seeds with a loose winged skin, and a minute embryo in the base of fleshy albumen. Only about twenty species of *Pyrolaceae* are known. They are natives of woods throughout the whole of the northern hemisphere, and are herbaceous or half-shrubby plants, with a corolla of four or five segments, which are almost petalae, but are slightly united at the base. Several species of *Pyrola* are natives of Britain, perennial herbaceous plants, with flowers of some beauty. Two species of *Chimaphila*, half-shrubby plants, with beautiful evergreen leaves, natives of North America, *C. umbellata* and *C. maculata*, are valued for their tonic, diuretic, and narcotic qualities, and are used in dropsy, calculus, strangury, and other diseases.

WINTERGREEN, Oil of, or *Gaultheric Acid*, is an essential oil yielded by the flowers of the *Gaultheria procumbens* (see GAULTHERIA), abundant in New Jersey, and consisting chiefly of salicylate of methyl ($C_2H_5O.C_{14}H_9O_5$), mixed with a small quantity of a hydrocarbon, termed *Gaultherilene*, which is isomeric with oil of turpentine, and which, being more volatile than the salicylate or methyl, is easily separated from it. The latter is so much the more abundant constituent of the oil, that the two may be practically regarded as identical. This oil is not only yielded by the distillation of other plants, as the leaves and flowers of *Monotropa hypopitys*, and the bark of *Betula lenta*, but may be artificially formed by distilling a mixture of 2 parts of crystallised salicylic acid, 2 of anhydrous wood-spirit, and 1 part of oil of vitriol. In whatever mode it is obtained, it presents the appearance of a colorless or yellow oil, of a powerful, agreeable, and persistent odor; and hence it is largely used in perfumery.

WINTER MOTH (*Cheimatobia brumata*), a species of moth, the caterpillar of which is very injurious to plum trees. It has long been well known as common in many parts of the continent of Europe, and has of late begun to be very abundant also in some parts of England, as in the Vale of Evesham, in Worcestershire, celebrated for its plum plantations, where damage has been done by it to the extent of £20,000 or £30,000 in a year. It is an insect about a half an inch long, of a light brown color. The male alone has wings; the female, as in a few other moths, is wingless. The eggs are hatched early in spring, and the cater-

Winter's Bark
Wire

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pillars, at first very minute, feed upon the buds of the plum. The eggs are deposited on trees, chiefly around the base of the buds, and in chinks of the bark. Like most of the moths this insect is nocturnal in its habits. It is during night that the males fly about the trees, and the wingless females creep up their stems. The best mode of preventing its ravages is to surround the stems of the trees with something over which the females cannot climb from the ground, in which they pass their chrysalis stage. Boxes are used for this purpose in Germany, in which the ascending insects are trapped. A more easy method is to coat the trees with a composition of tar and grease in the beginning of winter, the time at which these moths appear in their perfect state, and when, of course, the laying of eggs takes place. By visiting the plantation of plum trees with a lantern at this season, the gardener is often also successful in killing great numbers of them.

WINTER'S BARK, a stimulant, aromatic, and tonic bark, resembling cinnamon, and used for the same purposes. It derives its name from Captain Winter, who first brought it from the Strait of Magellan in 1579. It is the produce of *Drimys Winteri*, a native of some of the mountainous parts of South America, and abundant in the lower grounds of Cape Horn and Staten Island—an evergreen shrub with laurel-like leaves, corymbs of white flowers, and many-seeded berries. This shrub belongs to the natural order *Magnoliaceæ*, and to a section of it which has by some been constituted into a separate order, *Winteraceæ*, chiefly distinguished by dotted leaves and aromatic qualities. The Star Anise (*Illicium*) is nearly allied to it. The bark of other species of *Drimys* has similar properties to Winter's Bark, as that of *D. Granatensis*, much used in Brazil as a remedy for colic, and of *D. axillaris*, a New Zealand tree.

WINTERTHUR, one of the most industrious and beautiful of the smaller towns of Switzerland, in the canton of Zurich, stands on the Eulach, 14 miles north-east of Zurich. Its situation among hills, many of which are clothed with vines, is especially pleasant. Cotton-spinning, cotton-printing, dyeing, and the manufacture of machinery and weapons, are actively carried on. Pop. (1870) 9404.

WINTHROP FAMILY.—John, governor of the colony of Massachusetts, was born in Groton, county of Suffolk, England, January 12, 1588, was bred to the law, appointed Justice of Peace at the age of 18, and on account of his excellent and pious character, was, in 1629, elected by the governor and company of Massachusetts Bay to govern their colony. He sold his estate, and April 7, 1630, sailed from Yarmouth with 900 persons. During the voyage, he composed an essay, entitled "A Model of Christian Charity." He was re-elected governor every year until 1634, when he became deputy-governor under Sir Harry Vane, with whom he had an animated controversy on the doctrines of Mrs Hutchinson. In 1637 he was elected over Sir Harry, and continued governor, with a brief interval, during his life, and had more influence probably than any other man in forming the political institutions of the Northern states of America. He was opposed to an unlimited democracy, for he said: "The best part of a community is always the least, and of that best part the wisest part is always the lesser." He kept a journal up to 1649, two books of which were published in 1790; and the third, found in the New England Library, kept in the tower of the Old South Church in Boston, in 1816. A revised edition was published at Boston, in 2 vols. (1825—1826). He died at Boston, March 26, 1649.—JOHN, governor of Connecticut, son of the preceding, was born at Groton, England, February 12, 1606; educated at Trinity College, Dublin; made the tour of Europe; went to America in 1631, was chosen a magistrate in Massachusetts, but returned to England; and in 1635 went to Connecticut, built a fort at the mouth of the Connecticut River, was made governor of the colony, and founded the city of New London in 1661. He obtained a charter for the colony from Charles II., and was first appointed governor under it; and, in 1676, represented his colony in the congress of the united colonies at Boston. He was a man of eminent virtues, and considerable acquirements. Some of his papers are contained in the "Philosophical Transactions." He died at Boston, April 5, 1676.—JOHN, LL.D., American scholar, a descendant of the first Governor W., was born in Massachusetts, 1715; graduated at Harvard College, 1733; and in 1738 was appointed Hollis Professor of Mathematics and Natural Philosophy. In 1740, he observed the transit of Mercury; and, in 1761,

went to Newfoundland to observe the transit of Venus. He published tracts on Earthquakes, Comets, and other astronomical subjects. Died at Cambridge, May 8, 1779.—**ROBERT CHARLES, LL.D.**, American statesman and orator, descendant of the sixth generation from the first Governor W., was born at Boston, May 12, 1809, graduated at Harvard College in 1828, studied law with Daniel Webster, and was admitted to the bar in 1831, but soon abandoned law for politics, and was elected to the state legislature in 1834, where he served five years, three as Speaker of the House. In 1840, he was elected to Congress, of which he was a member for ten years. In 1847, he visited Europe, and was the Wig candidate for Speaker, but defeated after a balloting of three weeks. In 1850, he succeeded Mr Webster, who became Secretary of State, as senator from Massachusetts, a place in which he was succeeded by the more radical Charles Sumner. He was also defeated as a candidate for governor of Massachusetts. He published "Life of J. Winthrop," "Memoir of N. Appleton" (1861), "Speeches" (1853—1867), and "Washington, Boudoin, and Franklin" (1876).

WIRE AND WIRE-DRAWING. The facility with which any metal can be drawn into wire depends upon its ductility. Most metals have this property; but some, like bismuth and antimony, are so brittle that they can only be drawn out with difficulty, and wire made from such metals is useless, from want of tenacity. See DUCTILITY.

Metals largely used for making wire, such as iron, brass, and copper, are drawn by essentially the same process. We may take iron as an example. It is prepared by cutting up flat rolled plates into square rods of a given thickness. This is done by means of a pair of slitting rollers; one of these has grooves, equal to the breadth of the rods wanted, fitting into corresponding grooves in the other, which cut up the metal like scissors. The rods are cleaned of scales of oxide, either by mechanical rubbing, or by chemical treatment with dilute sulphuric acid. If the rod is thick, it has its square edge taken off by rollers. It is then drawn into wire by forcing it through the hole of a *draw-plate*. This is an oblong piece of hard steel pierced with conical holes, gradually diminishing in diameter, and having the smallest ends of these tapering holes carefully prepared to the required size. Sometimes cubical-shaped dies, each with a single trumpet-shaped hole, are used. The motion is given by means of bevelled wheels connected with a shaft driven by steam or water-power.

The workman commences by making a point on the rod, so as to allow it to pass through the hole, and he grasped by a pair of pincers attached to a chain, which draws it out till the length is sufficient to pass round the cylinder. This much is done by hand, and then the cylinder, being put in gear, is made to revolve and pull the wire through the draw-plate—coiling it round itself as the drawing proceeds. After being once drawn, it is again passed through a smaller hole, and so the process is repeated till it has been reduced to the size required. Fine wire may require from 20 to 30 drawings. The cylinder revolves slowly with a thick wire, and the speed is increased as the size diminishes. After being passed a few times through the draw-plate the metal becomes brittle, and requires to be annealed. Sometimes, a lubricating substance—as wax, grease, or soap—is employed during the drawing, especially for fine wires.

For some very accurate purposes, such as chronometer springs, and for gold and silver lace, the wire is drawn through jewelled holes, that is, holes perforated in rubies and other hard gems. A silver wire 170 miles long, and about 1-8000th of an inch in diameter, has been drawn through a hole in a ruby, and found, by a micrometer, to be of exactly the same size at the end as at the beginning; whereas the drawing of a length of 16 miles of brass wire through a steel draw-plate necessitates a readjustment of the hole.

Platinum wire can be drawn as thin as 1-8000th of an inch in diameter by first encasing it in silver, drawing down the compound wire, and then dissolving off the silver with nitric acid. By the same process, gold wire can be obtained only 1-5000th of an inch in diameter. It has been shewn by Babbage, as an illustration of how greatly labor increases the value of a raw material, that one pound of iron, which costs twopence, will yield 50,000 wire pendulum springs for watches, each weighing about one-seventh of a grain, and selling at the retail price of twopence.

Wire, although mostly cylindrical in form, is drawn of many different sections,

such as oval, half-round, flat, triangular, moulded, and the grooved pinion-wire from which the small toothed pinions for clocks and watches are cut. Copper wire of different forms is used to form patterns in the blocks used by calico-printers.

The following table (given by Dr. Toulminson) of weights, omitting fractions of a pound, which were sustained by wires 0.787 of a line in diameter, shews the comparative tenacity of a few of the metals: Iron, 549 lbs.; copper, 802 lbs.; platinum, 274 lbs.; silver, 187 lbs.; gold, 151 lbs.; zinc, 110 lbs.; tin, 85 lbs.; lead, 28 lbs. It may be remarked here that some kinds of brass wire have been noticed to become extremely brittle in the course of time, especially if subjected to vibration, and even to break when used to support objects, without any assignable cause.

The quantity of wire used in the English manufacturing districts must be enormous, steel and iron wire being required for the manufacture of needles, fish-hooks, hooks and eyes, carding-machines, screw-nails, fencing, and basket-work; brass wire for the manufacture of pins, wire-cloth for paper-making and other machines, and chain-making; and copper wire for bell-hanging. Nothing, however, has increased the production of wire, both iron and copper, more than the electric telegraph. Belgium, which a few years ago exported none, now exports 1200 tons annually of iron wire.

WIRE-ROPE have come greatly into use of late years for winding purposes in mines and on inclines, for the rigging of ships, and for numerous engineering contrivances; also for the construction of electric-telegraph cables. They are almost always "galvanised," that is, coated with zinc. A hemp rope 6 inches in circumference, and weighing 9 lbs. per fathom; an iron-wire rope $2\frac{1}{2}$ inches in circumference, and weighing 5 lbs. per fathom; and a steel-wire rope $1\frac{1}{2}$ inch diameter, and weighing 3 lbs. per fathom, are all of equal strength—the breaking strain of each being 10 tons.

WIRE-WORM, a name given by farmers and gardeners to the larvæ of Click Beetles (q. v.), which are long and hard, and often swarm in corn fields, gardens, and pastures, feeding on the roots of crops, and doing great mischief. The best known British species are *Elatér* or *Agriotes lineatus*, *E.* or *A. obscurus*, and *E.* or *A. sputator*. The first of these, which is the largest, is in its perfect state about half an inch long, with brown head and thorax, clothed with chitinous down; the elytra tawny, striped with brown. The larvæ, when full grown, is fully half an inch long, very narrow, yellowish, hard, and shining, the jaws tipped with black. The second species named is in its perfect state of an earthy-brown color. The third has a black head and thorax, with many dots, the elytra light brown with dotted lines. It is only about a quarter of an inch in length. Wire-worms are very small when first hatched, and are said to live for years in the larvæ state. Moles, rooks, and pheasants are useful in destroying them. Clover crops are said to have the effect of increasing their numbers. Farmers and gardeners resort to various means in order to get rid of this pest, as hard rolling after a top-dressing of lime, and mixing spirits of tar, gas-lime, or rape cake with the soil; but one of the most effectual is the strewing of slices of potatoes or turnips on the ground, under which they soon congregate, and great numbers are thus easily destroyed. The name *W.* is often very vaguely used, so as to include not only the larvæ of some moths, but even myriapods of the genus *Julus* (q. v.), which somewhat resemble the true wire-worms in form, although in reality very different, and probably not injurious to crops, as they are.

WISBECH, or Wisbech, a market-town in Cambridgeshire, in the Isle of Ely, occupies a position of importance in the Fen District, on the Nen, 18 miles east-north-east of Peterborough. *W.* is connected by a branch of the Great Eastern Railway with Peterborough; and two railways are at present in course of construction, which, when completed, will connect it with the Great Northern branch to King's Lynn, and directly with the Great Northern main line. By the Nen, which falls into the Wash, at the distance of 12 miles below *W.*, communication is maintained between this town and the North Sea. The navigation of the river has been much improved within recent years, and *W.* is considered the port of Cambridgeshire. It is generally well built, contains a number of useful institutions, and carries on rope-spinning, brewing, and general trade. Corn, timber, wool, salt, and seeds are exported; wine, deals, oil-cake, corn, slates, and coal imported. In 1876, 481 vessels, of 70,029 tons, entered, and 324, of 47,456 tons, cleared the port. Pop. (1871) 9362.

WISBY, a once famous seaport of the Swedish island of Gothland (q. v.), capital of the island, and situated on its west coast, about 180 miles south of Stockholm. It is of the highest historical and antiquarian interest; and though the time of its foundation is unknown, it was, during the 10th and 11th centuries (300 years before the establishment of the Hanseatic League in 1441), one of the most important commercial cities in Europe. It was a principal factory of the Hanseatic League during the 14th and 15th centuries. The eastern trade, which during the 11th and 12th centuries passed through Russia, and thence down the Baltic to Gothland, centred in W., and greatly enriched that port. In 1361, Valdemar III. of Denmark took the town by storm, and, plundering it, obtained an immense booty. This was a fatal blow to the prosperity of the place. The architecture of W. is exceedingly interesting. Its ancient feudal walls and towers exist in almost as entire a state as they were in the 13th c., and render its appearance, as seen from the sea, exceedingly striking. The early grandeur of the town is attested by the fact, that it contains, well-preserved, the remains of 18 churches, all of which date from the 11th and 12th centuries, are varied in form and ornament, and are a mine of interest to the student of Early Gothic. The oldest is the church of the Holy Ghost, built in 1046. St Mary's, built in 1190, is the only church now kept up for the use of the inhabitants. Pop. about 6300.

WISCHEHRAD (Old Slav. and Bohem. *vyscherad*, Pol. *wyszogrod*) is the name of numerous towns and castles in all Slavonic countries: e. g., the original residence of the princes of Bohemia, now a quarter of the city of Prague. The word is composed of the root *wys* or *wysch*, high, and *hrad* (Rus. *gorod*, Pol. *gorod*, in some dialects *grätz*), a fort, castle, town. *Hrad* is from the same root as Ang.-Sax. *hreoð*, Eng. *reed*, *rod*, another form being *yrds* or *yard*. It signified primarily a place defended by rods or poles, a palisaded fort, and hence a town. See *TOX*.

WISCONSIN, one of the United States of America, between lat. 42° 31'—47° n., and long. 87° 8'—92° 54' w.; 802 miles from north to south, and 258 from east to west; containing 53 924 sq. m., or 34,511,600 acres; is bounded n. by Lake Superior and the state of Michigan, e. by Lake Michigan, s. by Illinois, and w. by Iowa and Minnesota, from which it is separated by the Mississippi and St. Croix rivers. It is divided into 60 counties. Its chief towns are Milwaukee, Fond du Lac, La Crosse, Oshkosh, Racine, Jaccville, Watertown, Madison (the capital), &c. Its chief rivers are the Mississippi and its branches, Rock, Wisconsin, Black, Chippewa, and St. Croix, which drain four-fifths of its surface; the Menomonee on the north-eastern border; Wolf and Fox, emptying into Green Bay; and numerous small rivers emptying into Lakes Michigan and Superior. Besides these great lakes and Lake Winnebago, the whole state is studded with small, clear, and beautiful lakes, well stocked with fish. The country is a high rolling prairie, from 600 to 1200 feet above the sea, with no considerable mountains, but numerous hills or mounds. In the rainy season, the rivers Fox and Wisconsin, emptying into the Mississippi and Lake Michigan, flow into each other. The geological formations extend only from the Primitive to the Devonian. On Lake Superior are primitive rocks, granite, magnetic iron, quartz, slate, sandstone, drift, and beds of red clay and marl; sandstone cliffs on the Mississippi; the middle and southern parts of the state have the Lower Magnesian Limestone, a belt of white sandstone with beds of shells, then the lead-bearing group of Upper Magnesian Limestone. Besides the great magnetic iron bed on Lake Superior, and the rich lead region bordering on Illinois, copper is found in several places; zinc, some silver, plumbago, bitumen, peat, fine marble (some of light pink with red veins, and blue and dove color), gypsum, and coal in small quantities. Of the curiosities are earthworks in the forms of men and animals; ancient fortifications; Devil's Lake, of 600 acres, on the summit of a mound 300 feet high; the precipitous shores of Lake Pepin rising to 500 feet, 200 feet being a perpendicular wall of magnesian limestone; the high bluffs of the Mississippi and Wisconsin rivers; the falls of the St. Louis (330 feet in 16 miles) and of the Menomonee (124 feet in 1½ mile). The climate is cold, the winters long and severe; but the state is considered one of the most healthy in the west. The soil in the north is broken, with drift and boulders, covered with heavy pine forests, and not well adapted to cultivation; the middle and southern region, of prairies and park-

like oak openings, is exceedingly rich and productive, raising great quantities of wheat, Indian corn, oats, barley, potatoes, tobacco, &c. Besides the great pine-forests of the north, there are spruce, cedar, various oaks, hickory, birch, elm, sycamore, sugar-maple, &c. Of animals there remain the elk, deer, bear, foxes, wolves, beaver, gopher, &c.; and numerous birds and waterfowl, fattening upon the wild rice, on the margins of the numerous lakes. The chief manufactures are of iron, lumber, agricultural implements, flour, spirits, and malt liquors. The amount of wheat raised in 1873 was estimated at \$6,322,000 bushels. The total valuation of property in 1875 was 421,235,359 dollars. In 1876, there were 2565 miles of railway, and extensive lake and river navigation. State and government appropriations of land have richly endowed a state university at Madison, normal, high, and common free schools, and the usual State asylums. The constitution and government closely resemble those of the older states. In 1870, there were 1406 churches, of which 396 were Methodist, 304 Roman Catholic, and 143 Baptist. W. was explored by the French missionaries in the latter part of the 17th c., and Indian trading-posts were also established; but the actual peopling of the state has been recent, and very rapid—a large proportion being of foreign birth—German, Norwegian, Irish, Welsh, &c. It was organised as a territory in 1836, and admitted into the union as a state in 1848. Pop. (1840) 30,945; (1850) 305,321; (1860) 775,873; (1870) 1,054,670; (1880) 1,315,497.

WISCONSIN, a river of Wisconsin, U.S., rises in the northern centre of the state, and flows south and west to join the Mississippi. Length, 270 miles. A canal, completed in 1850, connects with the Fox River; so that there is steam-boat communication between Lake Michigan and the Mississippi.

WISE, Henry Alexander, American statesman, was born at Drummoundtown, Accomac county, Virginia, December 8, 1806; graduated at Washington College, Pennsylvania, in 1825; studied law at Winchester; settled and married at Nashville, Tennessee, but two years after returned to his native county, and engaged in politics; in 1825, advocated the nomination of General Jackson at the Baltimore Convention; opposed nullification, but maintained the state-rights doctrines of Jefferson and Madison as expressed in the Virginia resolutions of 1793, that "each state for itself is the judge of the infraction of the constitution, and of the mode and manner of redress." Elected to Congress in 1833, he was involved in a duel with his opponent, whose arm he fractured. On the removal of the government deposits by General Jackson, he went over to the opposition or Whig party, but was sustained by his constituents, over whom he had an unbounded personal influence. In 1837, he was the second of Mr Graves, a member of Congress from Kentucky, who shot Mr Ciley, a member from Maine, in a duel. In 1840, he secured the nomination of John Tyler as Vice-president; and on Tyler becoming President by the death of General Harrison, had a powerful influence in his administration. Nominated minister to France, he was rejected by the Senate, but confirmed for Brazil, where he resided until 1847. He was now once more identified with the Democratic party; and in 1854, after an arduous electioneering campaign, in which, though in feeble health, he travelled 3000 miles, and made 50 stump speeches against the "Know-nothing" or Protestant native American party, he was elected governor of Virginia. In 1859, he published a treatise on Territorial Government, maintaining the right of Congress over the institution of slavery. In December of that year, he signed the death-warrant of John Brown, hanged for treason in attempting to excite a negro insurrection. In 1861, as member of the Virginia Convention, he labored for conciliation; but when his state voted for Secession, he entered heartily into the war, and was appointed Brigadier-general, serving in the Kanawha Valley, and later, defending Roanoke Island, where his son, Captain Wise, was killed.

WISEMAN, Nicholas, Cardinal and Roman Catholic Archbishop of Westminster, was born August 2, 1803, at Seville, of an Irish family settled in Spain. He was brought to Ireland in his childhood, and received his first education at Waterford, whence he was removed to the Roman Catholic college of St Cathbert at Ushaw, near Durham. In his 16th year, he entered as an ecclesiastical student the English College at Rome, and after a very brilliant course, received holy orders at Rome in 1823, at which time he was also admitted to the degree of Doctor of Divinity, and was appointed Vice-rector of the English College, and Professor of

Oriental Languages in the university of the Sapienza. In 1823, he published his "Hors Syriace," and in the end of that year was named Rector of the English College. It was while he held this office that he delivered his "Lectures on the Connection of Science and Revealed Religion" (2 vols. 8vo, 1836). But in England he first became known by a series of lectures on "The Doctrines of the Catholic Church," delivered at Moorfields Church, and published in two vols. in 1836. In the same year he established, in concert with Mr O'Connell, the "Dublin Review," a journal which has since continued to be the quarterly organ of the Roman Catholic body, and to which Dr W., even while residing abroad, was a regular contributor. In 1840, he was named Conductor Vicar-apostolic of the Central District of England, with the title of Bishop of Melipotamus *In Partibus Infidelium* (q. v.). At the same time he was appointed President of St Mary's College of Oscott, where he took up his residence. The circumstances of religious parties in England at this period contributed much to bring Dr W.'s very remarkable abilities as a polemical writer into prominence; and the dissensions which arose in the Church of England during the Tractarian Controversy, were turned to effect by him in various lectures, pamphlets, reviews, essays, &c. In 1846, he was transferred as Conductor Vicar-apostolic to the London district; and in 1849 became himself acting vicar. In the following year, he came still more remarkably into notice, during the progress of a change in the position of the Roman Church in England, which, for a time, was the occasion of almost unexampled religious excitement in the country. From the reign of Elizabeth, the sees in England having been occupied by bishops of the Established Church, and it being penal for a bishop or priest of the Roman Catholic Church to officiate in England, the Catholics, for the necessary religious ministrations of their church, had resorted to the well-known expedient of a system of bishops *In Partibus Infidelium* (q. v.) with the title and authority of Vicars Apostolic (q. v.). This form of church government, with some modifications, had in substance subsisted from the time of James I.; but from the date of the passing of the Catholic Emancipation Act, a desire had gradually sprung up among Catholics for the restoration of the normal form of church government by the appointment of regular bishops. This measure was finally determined on by the pope in the year 1850, and a new distribution of the kingdom was made into twelve sees (one of them archiepiscopal), in which, in order that it might not be supposed to clash with the existing episcopal system, the names of the ancient sees were carefully avoided, the titles of the new bishops being taken exclusively from cities and towns which were non-episcopal. Dr W. was named archbishop of the see of Westminster, which included great part of the district already under his charge, and was at the same time created cardinal. This measure, for which the Protestant public were but little prepared, and which was made more formidable in their eyes by the language which was employed, although but following the established canonical forms and bearing altogether on the spiritual concerns of the Catholics, was supposed to involve an invasion of the rights and dignities of the Established Church and of the crown, and called forth a storm of religious excitement which was unexampled during the memory of the living generation. Whilst this excitement, which was much influenced by a letter addressed by the prime minister to the Bishop of Durham, was at its height, the new cardinal, who had gone to Rome to receive the cardinal's hat, returned to England, and published an explanatory address of great ability and moderation, but yet firmly asserting the strictly constitutional rights of his fellow-Catholics, entitled "An Appeal to the Reason and Good Feeling of the People of England on the Subject of the Catholic Hierarchy." This address, as well as certain lectures subsequently delivered by him, and extensively circulated, did much to mitigate the excitement, which nevertheless led to violent debates in parliament and to the passing of an act prohibiting the use of ecclesiastical titles other than those recognised by the law. See ECCLESIASTICAL TITLES ASSUMPTION ACT. Notwithstanding these unfavorable circumstances of his introduction into notice in England, however, the undoubted abilities and great literary eminence of Cardinal W. eventually compelled the admiration of the British public. He took frequent occasion, moreover, by public lectures and addresses on the neutral subjects of education, literature, and art, to identify himself with the spirit of progress, and with the national sentiments of his fellow-countrymen; and notwithstanding the infirmity of his constitution, which began to fail soon after his return to England as cardinal, he published during these years a succession of works which, although with the strong

Wishart
Witchcraft

religious bias natural to a Roman Catholic churchman of earnest convictions, possessed much, nevertheless, congenial to the sympathies of cultivated Englishmen of every degree. The "Lectures on Religion and Science" already referred to; "On the Connection between the Arts of Design and those of Production;" on the "Influence of Words on Thought and Civilization;" on the "Points of Contact between Science and Art;" "Recollections of the Last Four Popes," and other similar works, obtained an extensive circulation; and partly from their effect upon the public mind, partly, no doubt, from the reaction consequent on what was soon felt to have been a groundless and exaggerated alarm, Cardinal W. came by degrees to command the respect of the public at large. He died in his 63d year, on the 15th of February 1865; and his funeral, which was conducted with great solemnity, and excited great public curiosity and interest, was witnessed with every demonstration of respect by one of the largest assemblies seen for many years in London. Besides admittedly high professional learning, he was a scholar of rare and singularly various attainments, an eminent linguist, a well-informed scientific scholar, a distinguished orator, a graceful and vigorous writer, and an accomplished critic and connoisseur of art. In addition to the works incidentally mentioned above, he published "The Real Presence of the Body and Blood of Our Lord Jesus Christ in the Eucharist" (8vo. 1836); "Reply to Dr Turton on the Eucharist" (8vo. 1839); "Lectures on the Ceremonies of Holy Week" (8vo. 1839); "Essays on Various Subjects" (3 vols. 8vo. 1853)—a selection of articles contributed to the "Dublin Review" and other periodicals, and of other fugitive essays; "Fabiola, or a Church of the Catacombs;" a singularly truthful and life-like picture of early Christian life in classic Rome; "Sermons" (3 vols. 8vo. 1864); with many shorter publications. He also left a large collection of MSS., many of them prepared for the press. In 1866 appeared "The Witch of Rosenberg, a Drama in Three Acts;" and "Daily Meditations" in 1868.

WISHART, George, one of the early Reformers of Scotland, is supposed to have been a native of Forfarshire, a son of James Wishart of Pittarrow, justice-clerk in the reign of James V. The exact date of his birth is unknown. He first emerges into notice in the beginning of the 16th century. At this time he taught a grammar-school at Montrose, and made himself remarkable by introducing the study of Greek. He began also to preach the doctrines of the Reformation and was obliged to flee into England. Here he is found at Bristol about 1538, preaching the same doctrines, but being seized upon and threatened with death, he publicly recanted. Later he is found at Cambridge, in the centre of the Anglican Reform movement, which had begun there under the influence of Blinney and Latimer. He is described at this time by a pupil of the name of Tylney as a "tall man, pold-headed, of melancholy complexion, black-haired, long-bearded, comely of personage, well spoken after his country of Scotland, courteous, lowly, lovely, glad to teach, desirous to learn, abstinent in his habits, and very charitable to the poor." His portrait, which has been preserved in the university of Glasgow, answers to the personal characteristics here mentioned. He returned to Scotland in 1543 or 1544, with the commissioners sent to negotiate a treaty with Henry VIII., and it was then that he entered upon his special reforming mission, terminating in his martyrdom. He appears to have possessed great powers as a preacher, although it is doubtful whether he ever took orders; and he travelled from town to town, and county to county, making everywhere a great impression by his stirring words. Knox has given in his "History," Book I., a very striking description of the effects of W.'s preaching. Its effects upon himself was the most important and fruitful of all. When the preacher came to Lothian, Knox, charmed by his character and teaching, attached himself to his person, bearing a "two-handed sword" before him. This precautionary defence was rendered necessary by two attempts supposed to have been instigated by Beaton against his life. His activity and influence were too prominent long to escape notice. Cardinal Beaton had had his eye upon him for some time, and while he rested at Ormiston, after preaching a powerful sermon at Haddington, he was made a prisoner by the Earl of Bothwell. Beaton himself was in the neighborhood with a considerable force, in case it should have been attempted to rescue him. He was conveyed to St Andrews, and immediately put upon his trial before an ecclesiastical tribunal. Arran, the governor, refused to give his countenance to the proceedings; but the Reforming preacher was

nevertheless condemned to be burned at the stake; and the sentence was carried out before the castle or episcopal residence at St Andrews on the 1st of March 1546.

W. is reported to have given utterance at the stake to a prophecy of the death of the cardinal, which took place about three months after his martyrdom. "But he who from yonder high place beholdeth us with such pride shall, within a few days, be in the same as ignominiously as now he is seen proudly to rest himself," are the words attributed to him. This has appeared to some recent writers to strengthen the suspicion, otherwise suggested, of W. having been accessory to the plot for assassinating the cardinal. The main ground of this suspicion is the discovery of a document in the State Paper Office, bearing that "a Scottishman called Wysshart," a friend of the Laird of Brunstone, was concerned in this plot. Mr Tytler confidently adopted the view that this friend of the Laird of Brunstone and the Reformer were the same person, and it cannot be denied that there are reasons in favor of this inference, not in the mere coincidence of the name, perhaps, but in the fact of the association of the person bearing it with the Laird of Brunstone, who was a familiar friend of W.; and further, in the fact, that Kirkcaldy of Grange and the Master of Rothes, who are mentioned in the document as conspiring either to "apprehend or slay the cardinal," were afterwards really his murderers. At the same time, it cannot be said that there is decisive evidence to prove that the "Wysshart" of the state document was George W., the Reformer and the martyr. The coincidences might be accidental, and the question will probably remain among the *questiones vexatæ* of Scottish history.

WISHAW, a thriving town of Scotland, in Lanarkshire, 15 miles south-east of Glasgow, has made great advances within the last thirty years. The staple trade of the district is coal, of which upwards of 1,000,000 tons are sent from W. annually. There are also numerous iron-works, &c. Pop., with Cambusnethan (1871), 10,607.

WISMAR, the second seaport of Mecklenburg-Schwerin, at the head of a bay of the same name, an inlet of the Baltic. Its harbor is the best on the Baltic coasts, and is furnished with shipbuilding docks. Its old fortifications have been removed; but many of its old buildings, which are exceedingly curious and picturesque, remain. Commerce, the fisheries, tobacco and sail-cloth manufactures, and agriculture are the principal employments of the inhabitants; there are also breweries and distilleries. W. is the terminus of a branch of the Mecklenburg Railway, and communication by steamers subsists between it and Copenhagen. Pop. (1870) 18,888.

WISSENBURG (German *Weissenburg*), till 1871 a French fortified town, now capital of a district in the German province of Lower Alsace, is on the Lauter, 84 miles north-north-east of Strasburg. It has a flourishing trade, and a pop. of (1871) 5885. Here was fought, on the 4th August 1870, the first great battle of the Franco-German war. Besides the fortifications of W., demolished in 1872, the Lines of W. are famous—a fine of works extending to Lauterburg, 9 miles south-east.

WISTARIA, a genus of plants of the natural order *Leguminosæ*, sub-order *Papilionaceæ*, having pinnate leaves and flowers in terminal racemes, the pod leathery. The species were formerly included in the genus *Glycine*. Some of them are amongst the most magnificent ornamental climbers known in British gardens. *W. frutescens*, a native of Virginia, Illinois, and other parts of North America of similar climate, found chiefly in marshy grounds, attains the length of 80 feet, and has beautiful racemes of fragrant bluish purple flowers. *W. Chinensis* or *consequana*, a native of China, has larger flowers in pendulous racemes, and its branches run to the length even of 90 feet. In Britain, these plants are generally trained on walls.

WITCHCRAFT * is merely the form that the belief in the arts of magic assumed under the action of certain notions introduced by Christianity. The powers supposed to be possessed by the witches, and the rites and incantations by which they acquired those powers, were substantially the same as belonged to the devotees

* Not a little light is thrown on the original conception of witchcraft, and the magic arts in general, by observing the primary meaning of the various terms employed in connection with them. The most striking thing is the number of those terms that come from roots signifying simple to do, *perform*. From this notion, the transition is easy to a variety of shades of meaning as is seen in *Lat. facinus*, which radically signifies a deed (from *facere*, to do), but became restricted to a bad deed, a

of the Greek Hecate (q. v.), the Striga and Venefica of the ancient Romans and the Vala or Wise Woman of the Teutonic pagans. But when, along with the knowledge of the one true God, the idea of a purely wicked spirit, the enemy of God and man, was introduced, it was natural that all supernatural powers not proceeding directly from the true God, should be ascribed to him. This gave an entirely new aspect to such arts: they became associated with heresy; those who practised them must be in compact with the devil, and have renounced God and the true faith. Previously, if a witch was punished, it was because she had been guilty of poisoning, or at least was believed to have poisoned or wrought some other actual mischief. Now, however, such power was only the power to work evil; and merely to be a witch was in itself a sin and crime that filled the pious mind with horror. This feeling, zealously fostered, first by the Catholic clergy, and then no less by the Protestant, rose to a frenzy that for four centuries filled Europe with the most shocking bloodshed and cruelty.

Almost all the various notions and practices noticed under the heads MAGIC, DIVINATION, INCANTATION, AUGURIES, CHARM, TALISMAN, ORDEAL, FETTERING, EVIL EYE, &c., are embodied more or less prominently in the huge mass of superstitions which formed the creed of witchcraft in its full development. A reference, therefore, to those heads, and to the kindred subjects of ASTROLOGY and ALCHEMY, saves the necessity of entering into descriptive details of what witchcraft was. What was new and distinctive in the witchcraft of Christendom was the theory of magical arts which it involved. The doctrine of the Devil (q. v.), as finally elaborated in the middle ages, established in the world a rival dominion to that of the Almighty. The Arch-fiend and his legions of subordinate Demons (q. v.) exercised a sway, merely permitted, no doubt, but still vast and indefinite, not only over the elements of nature, but over the minds and bodies of men—all except those who had been admitted by baptism into the number of the "redeemed" (see ATONEMENT), and continued to be guarded by the faith and rites of the church. The faithful could not be led into evil against their will, nor essentially injured in person; but not even they were altogether exempt from diabolic annoyance, for the immunity does not seem to have extended to their belongings. As a strictly logical consequence of this assumed constitution of things, it followed, that those mortals who had the gifts of producing supernatural effects of any kind (and that such gifts had been possessed by individuals in all

crime. The Greek *εργεῖν* or *εργεῖν* (= Eng. work), and the Lat. *facere, operari*, were used, without any addition, to signify to perform sacrifice or other sacred or magical rite. Accordingly, in Low Lat., *factura* signified sorcery; and in modern Ital. *fattura* = incantation, and *fattucchiara* = a sorceress or witch. Lat. *factum* becomes in Span. *hecho*, and means a crime; while *hechicero* is a sorcerer, and *hechiera*, a witch. The Portuguese *feiticão*, magic, is also from Lat. *factum*; and Sansc. *kratu*, a sacrifice, is from *kri* (= Lat. *creare*), to make.

The Eng. *witch* is *wicce* in Ang.-Sax., which has also *wiccan*, to fascinate, and *wiccanerāst*, the art of magic; the Low Ger. dialects have similar forms (e. g., Dutch *wikkertj* = witchcraft); in High Ger. there are no cognate names. These words, as is seen in the Dutch form, have clearly no connection with *witan* (Ger. *wissen*), to know, which is usually given as the root of the English *witch*; and the most probable etymology is that proposed by J. Grimm, who derives them from the Gothic *weihan* (O. H. Ger. *weihan*, modern Ger. *weißen*), which signified to consecrate, but which he infers to have meant primarily to do, make, perform (see "Deutsche Myth.," pp. 86, 88, 408; "Deutsche Gram.," lil. 181). *Wikt*, or *wicht*, is evidently a derivative from this root, and signified a thing made (Lat. *factum*), a creature, a person, and, in some Teutonic dialects, a demon. A *wicca* was thus a doer of sacred or magic rites (compare the "I'll do, I'll do, I'll do!" of Shakespeare's witches). *Wicked* is a participle from the same root, and signified primarily bewitched, accursed, hence perverse. *Wizard* is probably a masculine form of *wicca*.

Nearly corresponding to English *witch* were the Lat. terms *saga*, a knowing or wise woman; *strix*, *striga*, a kind of nocturnal bird, hence a witch; *venefica*, literally, a poison-maker, a concocter of drugs. The Ger. *hexe*, Old Dutch *haghebaes*, Ang.-Sax. *hægtesse* or *hægtesse* (from which Eng. *hag*), appear to come from *hag*, cognate with Lat. *sagus*. In O. Norse, *hagr* signifies dexterous, cunning.

ages and countries, was not for a moment questioned), must derive their power from the Prince of Darkness and be acting as his agents—always excepting, of course, those miraculous powers which the church herself claimed to exercise in the name of Heaven. Moreover, as the universally coveted powers of fortune-telling, and of controlling the elements for your own benefit or the hurt of your enemies, could not be supposed to be bestowed by a being of the devil's character except as a *quid pro quo*, and as the object dearest to the devil's heart—the very aim and end, in fact, of his struggle with the kingdom of light—was to win back as many as possible of the souls that had been redeemed from his dominion by the death of Christ; it was natural to conclude that the price he would demand for his gifts would be a renunciation of Christianity and entrance into his service. Hence it came to be the established belief, that in order to acquire the powers of witchcraft, the person must formally sell his or her soul to the devil. The idea of a covenant with the Arch-enemy was not involved in the early and heathen conception of magic. Originally, magic was identical with the lowest form of religion, that is, Fetichism (q. v.). It was grounded on the idea that certain natural objects and certain rites and observances had, in themselves, a mysterious power of producing wonderful effects; and the art of the magician consisted in the knowledge of these mysterious powers, and in the skill to combine and direct them to special purposes. The effects were not conceived as being produced by the interference of any conscious being—god or devil. On the contrary, a human being could, through magical means, acquire control over supernatural beings. The Hindus carry this notion so far, that they represent some of their sages as practicing austerities and performing sacrifices and other rites, until they can control the gods themselves, and even threaten their destruction along with that of the universe (see *VIŚVĀMITRA*). The higher kind of European magic in the middle ages was mixed up with what physical science there then was; and the most noted men of the time were addicted to the pursuit, or were at least reputed to be so. So far from deriving their power from the kingdom of darkness, the scientific magician, by the mere force of his art, could compel the occasional service of the Arch-fiend himself, and make inferior demons the involuntary slaves of his will.

A belief, however, had early existed that individuals in desperate circumstances had been tempted to purchase, at the price of their souls, the help of the devil to extricate them from their difficulties (see *THEOPHILUS*), and hence a suspicion began to grow that many magicians, instead of seeking to acquire their power by the laborious studies of the regular art, had acquired it in this illegitimate way. At last, as the system of dualism above mentioned became more perfect, the art of magic was wholly disabolised, and a compact with the Evil One was thought to be the sole character of supernatural power. See *FAUST*. This transformation took place earlier and more completely (about the 18 c.) in regard to those lower forms of the magical art which constitute witchcraft proper and which have from ancient times been considered the special province of women. The chief cause of the prominent part assigned to the female sex in this matter is noticed in the article *MAGIC*. In addition, it may be observed, that their more excitable temperament renders them peculiarly liable to those Ecstasies (q. v.) which have been associated with the gift of divination from the priestesses of the ancient heathen oracle down to the medium of modern spiritualism. Further, when witchcraft came to be prosecuted as hereby, the part assigned to woman in the Scriptural account of the Fall led to her being looked upon as especially suited to be the tool of the devil. Founded on this circumstance, a constant element of the creed of witchcraft came to be the belief in a carnal intercourse between witches and evil spirits. The devil was supposed to tempt them in the shape of a wooer, and the unholy compact was consummated in carnal fashion.

The bargain was usually in writing, signed with the witch's own blood. She was rebaptised, receiving a new name, and had to trample on the cross and renounce God and Christ (among Roman Catholics, also the Virgin Mary) in forms parodying the renunciation of the devil in the formula of Christian baptism. A mark was impressed on some part of her body; this mark remained for ever after insensible, and was one of the means of discovery employed by the witchfinders. The powers conferred by Satan on these covenanted servants of his were essentially the same as had always been attributed to sorcerers; the mode of exercising them was also the same, namely, by charms, incantations, concoctions, &c. The only change was in the theory. These mystic rites, instead of producing their effects by an in-

herent virtue, were merely symbols by which the witch conveyed her behests to the devil and his ministers, who obeyed them according to the compact. Another difference to be noted is, that the power was exclusively directed to work evil—to raise storms, blast crops, render men and beasts barren, inflict racking pain on an enemy, or make him pine away in sickness (which was usually done by making an image of wax, and sticking it full of pins, or setting it to melt away before the fire). If a witch attempted to do good, the devil was enraged, and chastised her. A remarkable circumstance is, that witches seem to have been powerless to serve their own interests, for they remained poor and miserable.

A prominent point in witchcraft was the belief in stated meetings of witches and devils by night, called *Witches' Sabbaths*. First anointing her feet and shoulders with a salve made of the fat of murdered and unbaptized children, the witch mounted a broomstick, distaff, rake, or the like, and, making her exit by the chimney, rode through the air to the place of rendezvous. If her own particular demon-lover came to fetch her, he sat on the staff before, and she behind him; or he came in the shape of a goat, and carried her off on his back. At the place of assembly, the arch-devil, in the shape of a large goat, with a black human countenance, sat on a high chair, and the witches and demons paid homage by kneeling to him, and kissing his posteriors. The feast was lighted up with torches, all kindled at a light burning between the horns of the great goat. Among the viands there was no bread or salt; and they drank out of ox-hoofs and horses' skulls; but the meal neither satisfied the appetite nor nourished. After eating and drinking, they danced to music played on a bag-pipe with a horse's head for the bag, and a cat's tail for a chanter. In dancing they turned their backs towards one another. In the intervals, they narrated to one another what mischief they had done, and planned more. The revel concluded with obscene debauchery; after which, the great goat burned himself to ashes, which were divided among the witches, to raise storms with. They returned as they came; and the husband was kept from being aware of the wife's absence by a stick being laid in the bed, which he mistook for her. The places of meeting were always such as had feelings of solemnity and awe attached to them, derived from tradition or otherwise; the more noted are known to have been places of sacrifice in heathen times (see WALPURGA).

The *prosecutions* for witchcraft form one of the most deplorable episodes in human history. They shew more strikingly than anything else has ever done, on the one hand, what relentless cruelty human nature is capable of under the influence of a fanatical delusion; and on the other, how little reliance is to be placed on the concurrence of any number of witnesses when any extensive excitement prevails on a subject involving the sentiment of wonder. Multitudes will be found testifying, and testifying honestly, to alleged facts which fall in with the prevailing belief, but have no better foundation than their own heated imaginations.

In the early laws of Rome, the Twelve Tables, there were penal enactments against him who should bewitch the fruits of the earth, or conjure away his neighbor's corn into his own field. A century and a half later, 170 Roman ladies were convicted of poisoning under the pretence of charms and incantations; which led to additional laws against such practices. But in all this, the penalties were directed against those who had done, or were believed to have done, positive injury to another; and this is probably the meaning of the Mosaic law against witchcraft. At all events, in the heathen world, the mere possessing, or being believed to possess, supernatural powers was not in itself a crime. It was feared, no doubt, as being liable to be turned to malicious purposes; but on the whole, magic was looked upon as a beneficial art, being, in fact, the only form of the healing art known, and in part also the religion of domestic life. This view of the subject continued to prevail for many centuries after the reception of Christianity. Constantine, in the 4th c., while ordaining capital punishment for those who practised noxious charms against the life or health of others, is careful to protect from prosecution all magical means used for good—such as warding off hailstorms and excessive rains ("Codex Justin." lib. ix. tit. 18); and the distinction between *black* and *white* magic was long kept up. It was through the prosecutions directed against heresy, which were systematically organised in the 11th c. (see INQUISITION), that the magic arts came gradually to be all dyed black alike. Along with errors in doctrine, the heretics were

almost always accused of magical practices, and their secret meetings were represented as a kind of devil-worship, attended with all kinds of abominations. Thus sorcery and heresy became synonymous; and to the dread of supernatural power was added the feeling of pious horror. White magic, no less than black, was now looked upon as the work of Satan; and the counter-charms against the malice of him and his agents were to be sought only in the rites of the church as ministered by the accredited servants of Heaven. The belief in this ecclesiastical white magic was as zealously cultivated by the Protestant clergy as by the Roman Catholic.

Fostered chiefly by the proceedings against heresy, the popular dread of witchcraft had been on the increase for several centuries; and numerous executions had taken place in various parts of Europe. At last, Innocent VIII., by his celebrated bull, "*Summis Desiderantes*," issued in 1484, gave the full sanction of the church to the prevalent notions regarding sorcery, and charged the inquisitors and others to discover and put to death all practitioners of these diabolical arts. Two special inquisitors, appointed for Germany (to which country the bull was specially directed), Heinrich Institor and Jacob Sprenger, with the aid of a clergyman of Constance, Johannes Gremper, drew up the famous "*Malleus Maleficarum*," or Hammer for Witches; in which the whole doctrine of witchcraft was systematised, a regular form of trial laid down, and a course of examination appointed by which inquisitors everywhere might best discover the guilty. From this we may date the beginning of the witch-mania proper. The edict of 1484 was subsequently enforced by a bull of Alexander VI. in 1494, of Leo X. in 1521, and of Adrian VI. 1522—each adding strength to its predecessor, and the whole serving to increase the agitation of the public mind upon the subject. The results were dreadful. A panic fear of witchcraft took possession of society; every one was at the mercy of his neighbor. If any one felt an unaccountable illness, or a peculiar pain in any part of his body, or suffered any misfortune in his family or affairs; or if a storm arose, and committed any damage by sea or land; or if any cattle died suddenly, or, in short, if any event, circumstance, or thing occurred out of the ordinary routine of daily experience—the cause of it was witchcraft. To be accused, was to be doomed; for it rarely happened that proof was wanting, or that condemnation was not followed by execution. Armed with the "*Malleus Maleficarum*," the judge had no difficulty in finding reasons for sending the most innocent to the stake. If the accused did not at once confess, they were ordered to be shaved and closely examined for the discovery of devil's marks, and if any strange mark was discovered, there remained no longer any doubt of the party's guilt. Failing this kind of evidence, torture was applied, and this seldom failed to extort the desired confession from the unhappy victim. A large proportion of the accused witches, in order to avoid these preliminary horrors, confessed the crime in any terms which were dictated to them, and were forthwith led to execution. Other witches seemed to confess voluntarily, being probably either insane persons, or feeble-minded beings, whose reason had been distorted by brooding over the popular witchcraft code.

In Germany, the prosecutions were carried to a frightful extent. In the small bishopric of Bamberg, 600 fell victims to the delusion in the course of about four years; and in Würzburg, which is not much larger, 900. In the small district of Lindheim, a twentieth part of the population were sacrificed in the same space of time. Similar accounts are on record regarding the other countries of Europe. In Geneva, in three months (1515–1516), 500 persons were burned. In the district of Como, 1000 persons were burned in one year (1524), and 100 per annum for several years afterwards. In France, about the year 1520, fires for the execution of witches blazed in every town; and throughout the century, the provincial parliaments were incessantly occupied with witch-trials and enactments against them, especially against that form of the superstition known as Lycanthropy (q. v.; see also *WERE-WOLF*).

In Eng^l and Scotland, the witch-mania was somewhat later in setting in than on the continent; but when it did so, it was little if at all less virulent—the Reformation notwithstanding. The statute of Elizabeth, in 1562, first made witchcraft in itself a crime of the first magnitude, whether directed to the injury of others or not; and the act of James VI., in the first year of his reign in England, defines the crime still more minutely: "Any one that shall use, practise, or exercise any invocation of any evil or wicked spirit, or consult or covenant with, entertain or employ, feed or re-

ward any evil or wicked spirit, *to or for any purpose*; or take up any dead man, &c.; such offenders, duly and lawfully convicted and attainted, shall suffer death." Many years had not elapsed after the passing of the statute, ere the delusion, which had heretofore committed but occasional local mischief, became an epidemical frenzy, devastating every corner of England. The poor creatures who usually fell victims are thus described by an able observer: "An old woman with a wrinkled face, a furrowed brow, a hairy lip, a gobber tooth, a squint eye, a squeaking voice, or a scolding tongue, having a ragged coat on her back, a spindle in her hand, and a dog by her side—a wretched, infirm, and impotent creature, pelted and persecuted by all the neighborhood, because the farmer's cart had stuck in the gateway, or some idle boy had pretended to spit needles and pins for the sake of a holiday from school or work"—such were the poor unfortunates selected to undergo the last tests and tortures sanctioned by the laws, and which tests were of a nature so severe that no one would have dreamed of inflicting them on the vilest of murderers. They were administered by a class of wretches, who, with one Matthew Hopkins at their head, sprung up in England in the middle of the 17th c., and took the professional name of *witch-finders*. The practices of the monster Hopkins, who, with his assistants, moved from place to place in the regular and authorized pursuit of his trade, will give a full idea of the tests referred to, as well as of the horrible fruits of the witchcraft frenzy in general. From each town which he visited, Hopkins exacted the stated fee of 20s., and in consideration thereof, he cleared the locality of all suspected persons, bringing them to confession and the stake in the following manner: He stripped them naked, shaved them, and thrust pins into their bodies to discover the witches mark; he whipped them in sheets, with the great toes and thumbs tied together, and dragged them through ponds or rivers, when, if they sank, it was held as a sign that the baptismal element did not reject them, and they were cleared; but if they floated—as they usually would do for a time—they were then set down as guilty, and doomed. He kept them fasting and awake, and sometimes incessantly walking, for 24 or 48 hours, as an inducement to confession; and, in short, practised on the accused such abominable cruelties, that they were glad to escape from life by confession. If a witch could not shed tears at command, said the further items of this wretch's creed, or if she hesitated at a single word in repeating the Lord's Prayer, she was in league with the Evil One. After he had murdered hundreds, and pursued his trade for many years—from 1644 downwards—the tide of popular opinion finally turned against Hopkins, and he was subjected, by a party of indignant experimenters, to his own favorite test of swimming. It is said that he escaped with life, but from that time forth he was never heard of again.

The era of the Long Parliament was that, perhaps, which witnessed the greatest number of executions for witchcraft. *Three thousand persons* are said to have perished during the continuance of the sittings of that body, by legal executions, independently of summary deaths at the hands of the mob. Witch-executions, however, were continued with nearly equal frequency long afterwards. One noted case occurred in 1664, when the enlightened and just Sir Matthew Hale tried and condemned two women, Amy Denny and Rose Callender, at Bury St Edmunds, for bewitching children. It is stated that the opinion of the learned Sir Thomas Browne, who was accidentally present, had great weight against the prisoners. He declared his belief that the children were truly bewitched, and supported the possibility of such possessions by long and learned arguments, theological and metaphysical. Yet Sir Matthew Hale was one of the wisest and best men of his time, and Sir Thomas Browne had written an able work in exposition of Popular Fallacies! Chief-justices North and Holt were the first individuals occupying high places who had at once the good sense and the courage to set their faces against the continuance of this delusion, and to expose the general absurdity of such charges (1694). Summary executions, however, continued for some years to be still common, in consequence of confessions extracted after the Hopkins fashion. In 1716, a Mrs Hicks and her daughter, aged nine, were hanged at Huntingdon for selling their souls to the devil, and raising a storm by pulling off their stockings and making a lather of soap! With this crowning atrocity, the catalogue of murders in England closes.

In Scotland, witchcraft as a crime *per se* was first made legally punishable by an

act passed in the reign of Mary (1563). On coming to execute the functions of majesty, James VI. made numerous official investigations into alleged cases of witchcraft, and derived a pleasure in questioning old women respecting their dealings with Satan. In 1590, James, it is well known, made a voyage to Denmark to bring home his appointed bride, the Princess Anne. Soon after his arrival, a tremendous witch-conspiracy against the happy conclusion of his homeward voyage was discovered, in which the principal agents appeared to be persons considerably above the vulgar. The king had all the accused brought before himself for examination, and even superintended the tortures applied to them to induce confession. One of them, Mrs Agnes Sampson, declared that one great object with Satan and his agents was to destroy the king; that they had held a great witch-convention at North Berwick for no other end; and that they had endeavored to effect their aim on many occasions, and particularly by raising a storm at sea when James came across from Denmark. The witches demanded of the devil why he bore such hatred to the king, who answered that the devil was the greatest enemy he had in the world. On this occasion, 80 persons were executed on the Castle-hill of Edinburgh. These proceedings, no doubt, gave occasion to the famous work on Demonology which James VI. published shortly after. The removal of James to England moderated but did not altogether stop the prosecutions. As the spirit of Puritanism gained strength, however, they again increased. The General Assembly was the body in fault on this occasion, and from this time forward the clergy were the great witchfinders in Scotland. The Assembly passed condemnatory acts (1640, 1648 1644, 1645, 1649), and with every successive act the cases and convictions increased with even a deeper degree of atrocious horrors than at any previous time. At a single circuit held at Glasgow, Stirling and Ayr, in 1659, 17 persons were convicted and burned for this crime. The popular frenzy seems to have exhausted itself by its own virulence in 1661—1662. After this period, the dying embers of the delusion only burst out on occasions here and there into a momentary flame. The last regular execution for the crime is said to have taken place at Dornoch in 1722, when an old woman was condemned by David Ross, sheriff of Caithness. The number of victims in Scotland from first to last has been estimated at upwards of 4000.

In the British colonies of New England, the witchcraft mania raged with peculiar intensity. As in Scotland and elsewhere, the clergy were the prime movers. Two clergymen have obtained a special and unenviable notoriety for the part they acted in this matter. The one was the Rev. Cotton Mather (q. v.), a man who was considered a prodigy of learning and piety, but whose writings and proceedings in regard to the trial and execution of witches, of which he was the chief instigator, shew a degree of fanaticism, credulity, and blind cruelty that is almost incredible. The other, a Samuel Parris, minister of Salem, made use of the popular feeling to gratify his own spite at individuals. At last, in the "Salem tragedy," as it is called, in 1692, the executions, torturings, and imprisonments rose to such a height as to be no longer endurable, a complete revulsion of public feeling took place, and the delusion was broken. For details of New England witch-trials, we must refer to No. 141 of "Chambers's Miscellany of Tracts."

Dr Sprenger, in his "Life of Mohammed," computes the entire number of persons who have been burned as witches during the Christian epoch at *nine millions*.

Throughout the middle ages, it is doubtful if one person could have been found who doubted the reality of witchcraft; and it was not till the middle of the 16th c. that any one had courage to raise his voice against the enormities which the delusion was occasioning. The first, probably, to do so was a physician of the name of J. Weyer ("De Præstigiis Demonum, &c."), in Germany, in 1563. He was followed in 1584 by Reginald Scot (q. v.), "a solid and learned person, beyond almost all the English of that age" (Hallam), who demonstrated the absurdity and impossibility of the prevalent notions. The delusion, however, was still in the ascendant, and found multitudes of defenders, who brand-ed the sceptics as "Sadducees." The most prominent of these champions was James VI. of Scotland, who, through his treatise on "Demonology" (1597), and his activity in thequisition of cases, is entitled to rank with Pope Innocent and the inquisitor Sprenger, as at the same time a chief enemy and chief encourager of witchcraft. At last the world began to awaken from the horrid nightmare; the feelings of the humane began to be shocked by the continued butchery, and the more intelligent to question, if

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not the existence of witchcraft, at least the evidence on which the accused were for the most part condemned. Advocates took courage to defend a reputed witch, and judges, like North and Holt in England, to throw cold water on the proceedings; and the frenzy gradually subsided all over Europe. Individual cases occurred later on the continent than in Britain. A man was executed at Würzburg in 1749 on a charge of sorcery; and a witch was burned at Glarus, in Switzerland, in 1782. Perhaps the latest instance of a judicial execution for witchcraft occurred in 1793, in the grand duchy of Posen. The laws against witchcraft were formally repealed in England in 1736, in Austria not till 1764.

The cessation of judicial proceedings, however, did not all at once put an end to popular outrages on supposed witches. In 1751, an aged female pauper and her husband were killed by a mob near Tring, in Staffordshire; and for the murder, one of the perpetrators was tried and executed. Not longer ago than 1863, a reputed wizard was drowned in a pond at the village of Hedingham, in Essex; and it was considered worthy of notice that nearly all the sixty or seventy persons concerned in the outrage were of the small-tradesmen class, none of the agricultural laborers being mixed up in the affair. Besides such violent outbreaks, striking revelations are frequently made in the course of judicial proceedings, how deep-seated and general the dread of witches continues to be throughout the more ignorant strata of European society, especially in rural places; and, concurrent with this, the faith, in the skill of certain "wise men" and "wise women" (white witches) to counteract their malicious practices. As recently as March 1867, a man calling himself Dr Harris (S. Wales) was committed for trial at the next Radnorshire Assizes, for duping various persons, by persuading them that their ailments was caused by their being "witched," and pretending to cure them by giving them written charms to wear. From one man he had extorted £4 from another £6, and so on.

The belief in magic or sorcery, in fact, continues to be the most energetic belief of the ignorant and degraded all over the world, no matter what their nominal religion is. To the mass of the adherents of Buddhism in Central Asia, the lama or priest is merely a wizard who knows how to protect them from the malignity of evil spirits; and, according to Livingstone and other travellers, trials and executions for witchcraft are at this day common throughout Africa, as they were in Europe in the 17th c., and under forms ludicrously similar. See ORDEAL, MAGIC.

Of the numerous books written about witchcraft, we note the following: "Sadducismus Triumphatus," Sadducism Vanquished, or, Considerations about Witchcraft," a work vindicating the belief in witchcraft, by Dr Joseph Glanvil, Chaplain-in-ordinary to Charles II., who was one of the first Fellows of the Royal Society, and wrote a meritorious treatise shewing the value of scepticism in science. R. Bixter (q. v.), in his "Certainty of the World of Spirits," upholds the same side. B. H. Bekker, a Reformed Dutch clergyman, was the first, at the end of the 17th c., to attack the very foundation of the abhorrent superstition—namely the belief in the devil himself, or, at all events, in the possibility of his interference in the affairs of this world. A successor of Dr Glanvil, D. F. Hutchinson, chaplain to George I., in his "Historical Essay concerning Witchcraft" (1718), writes from the sceptical point of view. Sir W. Scott, "Lectures on Demonology and Witchcraft," are entertaining but superficial. Brand's "Popular Antiquities of Great Britain," edited by Sir H. Ellis (1855), gives a collection of witch-beliefs put together without much connection or method. H. Williams's "Superstitions of Witchcraft" (1865) takes a wide historical view of the subject, and evinces extensive reading; although loosely put together, and a good deal spoiled by the ambition of fine writing and the display now and then of narrow Protestant feeling. It is on the whole one of the best books on the subject in English. C. Mackay gives a good digest of it in brief space in a section of his work on "Extraordinary Popular Delusions" (1841). Thomas Wright, "Narratives of Sorcery and Magic," 2 vols. (1853), contains a large collection of the most interesting stories of individual cases. Soldan's "Geschichte der Hexenprozesse" ("History of Witch-trials"), (Stutt. 1843). Garnier, "Histoire de la Magie en France," Ennemose, "Geschichte der Magie," 2d ed. (Leip. 1844); translated by W. Howitt (Lond. 1854). L. F. Alfred Maury, in "La Magie et l'Astrologie dans l'Antiquité et au Moyen Âge" (Lond. 1860), attempts to give a philosophy or theory of all superstitious beliefs. J. Grimm, "Deutsche Mythologie," with his

wanted sagacity and prodigality of learning, traces the several elements of the witch-creed to their roots in the beliefs of pagan times.

WITCH-HAZEL (*Hamamelis Virginica*), a North American shrub of the natural order *Hamamelidaceæ*. This order contains only a very small number of species, much diffused over the world, but none of them European; shrubs or small trees, with alternate, stipulate, feather-veined leaves, and small axillary unisexual flowers. The W. is often not more than 6 or 8 feet in height, dividing at the base into several cylindrical grayish branches. Sometimes it attains a height of 20 or 30 feet. The leaves are about four inches long, and two or three broad. The flowers are clustered, yellow and showy, with long linear petals. The appear in winter or at the season when other trees and shrubs are parting with their leaves. The English name is derived from the suppo-ed virtues of a forked twig as a divining-rod. The bark is much esteemed as a sedative and discutient.

WITENA-GEMOT (A.-S. *witena*, genitive plu. of *wita*, a wise man, from *witan* to know, and *gemot* assembly, from *metan*, to meet), the great national council of England in Anglo-Saxon times, by which the king was guided in all his main acts of government. Each kingdom had its own Witena-gemot before the union of the Heptarchy in 827, after which there was a general one for the whole country. It was composed of the chief ecclesiastics, the ealdormen (see *ANGLO-SAXONS*) of shires, and some of the chief proprietors of land. It would rather appear, though the matter is not quite free from doubt, that the lesser thanes, who formed part of the *æthr-gemot*, or next inferior court, were not entitled to form part of the general council. In the year 934, there were present at one of these assemblies King Athelstane, four Welsh princes, two archbishops, seventeen bishops, four abbots, twelve dukes, and fifty-two thanes.

The powers of the Witena-gemot seem to have been very extensive. The king's title, however hereditarily unexceptionable, was not considered complete without its recognition, and it possessed the power of deposing him. It could make new laws and treaties; and along with the king it appointed prelates, regulated military and ecclesiastical affairs, and levied taxes. Without its consent, the king had no power to raise forces by sea or land. It was also the supreme court of justice, civil and criminal. The Witena-gemot was abolished by William the Conqueror, and its powers were only in part transmitted to parliament.—See Hallam's "Middle Ages," c. 8; Sir F. Palgrave's "Rise and Progress of the English Commonwealth;" and Kemble's "Saxons in England."

WITHER, George, was born on the 11th June 1588, at Beniforth, an estate in Hampshire of which his father was proprietor, and which in due course fell to the son. He was educated at the grammar-school of Colemore, and afterward at Magdalen College, Oxford, which he entered in 1604. He remained there several years, and after passing some time at home, he went to London, and entered himself at Lincoln's Inn. His bent was, however, rather to literature than law; and he shortly became known in certain circles as a writer of clever verses. In 1613, he came before the public in a volume of satire, the title of which, "Abuses Stript and Whipt," in some sort defines its contents. Certain things in the book were considered offensive by the authorities, and he was sent to the Marshalsea prison, and kept there for some months. During his imprisonment were composed his "Satire to the Kings," and his "Shepherds' Hunting." In 1623, appeared a collection of his poems under the title "Mistress of Philarete, and in 1635, his "Emblems, Ancient and Modern." Though he had very much identified himself with the party of the Puritans, among whom his writings were most popular, on the breaking out of civil disturbance, he served as a captain of cavalry in the ill-judged and abortive expedition of Charles I. against the Scotch Covenanters in 1639. When a little later, however, the general discontent determined itself into the grand struggle between the king and the English parliament, he promptly sided with the latter, and raised a troop of horse for its service by the sale of his estate. In the army of the parliament he attained the rank of major; but of his special services not much is known. On one occasion he was taken prisoner, and is said to have owed his life to a joke of Denham's, who besought the royalists to spare his life, on the ground that so long as W. lived, he (Denham) was not the worst poet in England. On the final triumph of the side with which he had ranged

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himself, it appears that opportunities were afforded him of feathering his nest rather comfortably by the spoil of the defeated party. With the Restoration naturally a reverse came; and as the reputed author of a pamphlet entitled "*Vox Vulgi*," of a so-called seditious tendency, he was committed to the Tower, and an impeachment of him having been ordered, his life for a time seemed to be in some danger. The impeachment was not, however, proceeded with, and sooner or later—the date seems somewhat uncertain—he obtained his liberty. He died in London on 2d May 1667.

W. was an excessively voluminous writer. Upwards of 100 separate publications of his have been noted by modern bibliographers (see 1st and 2d vols. of Park's "*British Bibliography*"), yet, after his death, his poetry fell into oblivion, or, so far as remembered, was regarded with such contempt that we find him introduced by Pope in the "*Dunciad*," as "*wretched Withers*." A later time has, however, revised this decision; the grace, sweetness, fancy, and charm of natural simplicity which distinguish not little of his verse have since been sufficiently recognised; and a modest niche in the temple has been accorded him, from which he cannot now be degraded. The men to whom the re-ascension of his fame is chiefly owing are Southey, Lamb, and Sir Egerton Brydges. In his "*Shepherds' Hunting*," in particular, passages occur of such rare and finished beauty, that no collection of the choicest things in English poetry could be held to be complete which should omit them. His "*Hymns and Songs of the Church*" were edited, with an introduction, by Mr Edw. Farr in 1856. By far the best and most complete account of W.'s life and writings is to be found in Wilmott's "*Lives of the Sacred Poets*" (Lond. 1834).

WITNESS, a person summoned, or capable of being summoned, by a court of law, or some officer authorised to take evidence relating to a judicial or other proceeding. All persons are liable to be witnesses, either voluntarily or involuntarily, and it is a duty which every citizen owes to his fellow-citizens, to be available whenever his testimony is deemed desirable. It is a compulsory duty, and the presence of any person can be enforced, both in civil and criminal cases. In England, the usual mode of summoning a witness in a court of law, is by serving him with a *subpoena*, i. e., a formal writ proceeding in the Queen's name, reciting that a certain action is pending in a court named, and a trial is to take place, and commanding the witness to lay aside all and singular business and excuses, and appear at the time and place before the court mentioned, under a penalty (*sub poena*) of £100. This is called a *subpoena ad testificandum*. The corresponding term in Scotch law is *Diligence* (q. v.). If the witness is required to produce a document in his possession, it is called a *subpoena duces tecum*, and he is told in the writ to bring the document. If a witness do not attend at the time and place mentioned, he is liable to be punished, either by attachment, i. e., summary imprisonment for contempt, or by an action for damages at the suit of the party summoning him. The subpoena, or notice to attend, must be served a reasonable time before the witness is wanted, and it is generally necessary to give a day's notice beforehand. During a witness's attendance on this public duty, he is privileged from arrest: thus, he cannot be taken into custody for debt while he is going to, remaining at, or returning from the court. Moreover, he is entitled, before he go to the court, to have his reasonable travelling expenses paid to him, and a sum for subsistence while he remains in attendance. He is also entitled to a reasonable allowance for his lost time while attending a civil trial, and courts of law allow 6s. per day to a laborer or journeyman, 7s. 6d. to a master-tradesman, and £1 1s. to £3 8s. to professional men; to females, according to their station in life. A witness may, in a civil case, but not in a criminal case, refuse to give evidence until his expenses are paid. A witness, before examination, is required to take an oath, which may be in any form which he considers most binding on his conscience; but he must at least believe in a God and a future state of rewards and punishments. When a witness is examined, he is generally asked specific questions, first, by the party calling him, and during this examination in chief, the rule is that he is not to be asked leading questions, i. e., questions which suggest the answer that is required. The opposite party is then allowed to cross-examine the witness, and in doing so, may ask leading questions, or test in every way the truth of the witness's statement. After this, the witness is re-examined. There is a technical rule that the party calling a witness is not allowed to impeach his credit, or ask anything having that effect. There are cer-

tain questions which a witness may refuse to answer. Such are questions the answer to which might render the witness liable to a criminal charge or penalty; but he cannot refuse if the effect would merely be to render him liable to a civil action, or merely to degrade him. If a witness live in a foreign country, he cannot be compelled to come to this country by any subpoena, and therefore the only way of getting his evidence is to send a commission to some person in the foreign country to take the examination there. Where, however, a witness residing in Scotland is required for a trial in England, and *vice versa*, he may now be compelled by subpoena to attend in the same way as if he had resided in England or Scotland respectively. If the witness is aged or infirm, so that his attendance at the trial would be dangerous to him, he may be examined by a commissioner or examiner before trial. In England, when a witness is sworn, a New Testament is put in his hand, and after the officer of court repeats the form, he kisses the book. The form is: "The evidence you shall give to the court and jury, touching the matter in question, shall be the truth, the whole truth, and nothing but the truth." When the witness is a Jew or foreigner, the form varies. In Scotland, the witness, when sworn, stands, holding up his right hand, while the judge of the court repeats this form: "I swear by Almighty God, as I shall answer to God at the great day of judgement, that I shall tell the truth, the whole truth, and nothing but the truth, in so far as I know or shall be asked."

WITNEY, a small market and manufacturing town of Oxfordshire, in a dreary district on the Windrush, 10 miles west-north-west of Oxford. It is a neat and well-built town, consisting principally of two streets. There is a spacious cruciform church, a banquet-hall (built 1721), a town-hall, and cross (1683). It is celebrated for its blankets, which are distinguished for their peculiar whiteness, communicated, it is said, by the sulphureous qualities of the waters of the Windrush, used in their manufacture. This branch of industry has, however, somewhat declined, from the introduction of machinery for blanket-making in other towns. Gloves, malt, pilot-cloths, and teltng for paper are also manufactured. The Saxon form of the name is *Witaney*, and means, "the island of the Wise Men," or "the island of the parliament." W. is connected by a branch with the Great Western Railway. Pop. (1871) 2976.

WITTEKIND, a Westphalian chieftain, the most celebrated leader of the Saxons against Charles the Great, made his first appearance as leader in the expeditions which the Saxons undertook in 774 against the fortress of Eresberg, in Westphalia, and the Frankish province of Hessa, while Charles was subduing the Lombards. When most of the Saxon nobles submitted to the Emperor Charles at the imperial diet at Paderborn in 777, W. fled to Siegfried, king of Jutland, whose sister Gava he is said to have married. In 778, he returned, and when Charles was absent in Spain, began to lay waste the Rhine country. Charles's return obliged him again to take refuge in Jutland; but in 783 he fell upon the Frankish army by surprise at the Sinsleberg, and entirely annihilated it—an act for which Charles took frightful vengeance by the execution of 4500 Saxons. On this, all the Saxon tribes rose in arms, and the war was again led by W. until 785, when Charles entered into negotiations with him, the result of which was, that W. repaired to the emperor's camp at Attigny in Champagne, and received baptism. After that, he appears no more in history. According to the legend, however, that is still current among the people in Westphalia, Charles promoted W. to be Duke of the Saxons, and made over Engers to him. From his castle called Babilonie, situated in the neighborhood of Lübeck, he is said to have ruled with gentleness and justice till 807, when he met his death in a campaign against Duke G-rod of Swabia. His bones repose in the parish church of Engers, in the duchy of Ravensberg, where Charles IV., in 1377, erected a monument to him; and on October 18, 1812, another monument in his honor was erected at Minden by the Westphalian Society. The higher of the two hills which form the Westphalian gates on the Weser, near Minden, bears the name of Wittekindsberg.

WITTENBERG, a town of Prussian Saxony, a fortress of the third rank, stands on the right bank of the Elbe, 55 miles south-west of Berlin, and 69 by railway. It is interesting as having been the capital of the electorate of Upper Saxony, as the cradle of the Reformation, and as containing the remains of the reformers Luther

Woad
Wojwoda

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and Melancthon. The once famous university, in which Luther was professor, and mentioned by Shakespeare as the school where Hamlet studied, is now removed and incorporated with that of Halle. In the *Stadt-Kirche* are two remarkable but poor pictures supposed to be by their contemporary and friend Cranach, in one of which Melancthon is represented as dispensing the sacrament of baptism, and Luther as preaching to a congregation, of which the two foremost figures are his wife and son. In the *Schloss-Kirche* are the tombs of Luther and Melancthon, as well as those of Frederick the Wise (with a noble bronze statue by Vischer) and John, electors of Saxony. Upon the doors of this church—burned down by the French, but replaced by others of metal—Luther hung up his 95 theses against the papal doctrine of indulgences. The house of the great Reformer, containing his chair, table, &c., and two portraits of him by Cranach, remains almost unaltered. The houses of Melancthon and Cranach are also shewn. In the market-place is a bronze statue of Luther by Schadow, not far from which is also one of Melancthon; and outside the Elster Gate, a spot is pointed out as the place where Luther burned the papal bull. Manufactures of woollen and linen goods, hosiery, and leather are carried on. Brandy is distilled, and beer brewed. Pop. (1871) 11,567.

WOAD (*Isatis*), a genus of plants of the natural order *Cruciferae*, having a 1-celled, 1-seeded, laterally compressed pouch, with the valves keeled and eventually separating. It contains only a few species, mostly natives of the countries around the Mediterranean. DYER'S W. (*I. tinctoria*) is sometimes found in cultivated fields in England, but most probably has been introduced, as it was formerly much cultivated both in England and Scotland, for the sake of a blue dye obtained from its root-leaves. The use of this dye has in great part ceased, in consequence of the more general introduction and diminished cost of indigo. Dyer's W. is a biennial plant, with oblong cernate root-leaves about a foot in length, on pretty long stalks; an upright, much branched leafy stem, about 3 feet high; small yellow flowers, and large seed-vessels, about half an inch long and 2 inches wide, hanging from slender stalks. The leaves when cut are reduced to a paste, which is kept in heaps for about fifteen days to ferment, and then formed into balls which are dried in the sun, and which have a rather agreeable smell, and are of a violet color within. These balls are subjected to a further fermentation before being used by the dyer. When W. is now used, it is always in union with indigo, which improves the color. Even by itself, however, it yields a good and very permanent blue. It is supposed that W. was the dye used by the Picis for painting their persons. W. is now cultivated only to a very small extent in Britain.

WO'BURN, a township of Massachusetts, U. S., 10 miles north north-west of Boston, on the Boston and Lowell Railway, containing numerous factories supplied with water-power, country residences of wealthy Bostonians, numerous churches, academy, &c. Pop. (1860) 6773; (1870) 8560; (1880) 10,931.

WODEN. See Odin.

WODROW, Robert, the second son of James Wodrow, professor of divinity in the university of Glasgow, was born at Glasgow in the year 1679. He was educated at the university of his native city, and after passing through the classes in arts, studied theology under his father. At an early age he devoted a considerable portion of his time to historical researches, and to this taste he probably owed his appointment as librarian to the university. He did not hold this office long. Having finished his theological studies, in the year 1703 he received a license to preach from the presbytery, and in the month of October of the same year was appointed minister of Eastwood, a parish in the county of Renfrew, at no great distance from Glasgow. In that parish he remained till his death, faithfully discharging the duties of his office, and declining offers which were made to him of appointments to pastoral charges of more importance. He had been brought up in the strictest principles of Presbyterianism, and he zealously adhered to the party in the Established Church, which was most strenuous in maintaining those principles, and in resisting what were deemed to be the encroachments of the secular power. Soon after his settlement at Eastwood he began to devote his leisure hours to what became the chief object of his life—the writing of a history of the Church of Scotland from the Restoration to the Revolution. He spared no pains and no expense, so far as his limited means could afford,

in collecting materials for this work. He corresponded with all persons who could give him any information, and transcribed with his own hand the civil and ecclesiastical records bearing on his subject. The work was published in two folio volumes, the first in 1731, and the second in the following year. It was dedicated to King George I., whom the author styles "the best as well as greatest of kings;" and in the year 1725 he received an order on the Scottish exchequer for £105, as a mark of the royal bounty. It is probable that this sum was the chief pecuniary recompense of his labors; but considerations of that nature formed no part of the inducements which had led him to undertake the work. A second edition of the history, in 4 vols. 8vo, was published at Glasgow in 1828, under the editorship of Dr. Robert Burns. W. contemplated other works, chiefly of a biographical character, illustrative of the ecclesiastical history of Scotland. None of these were published till the present century. Two volumes of his collections on "The Lives of the Scottish Reformers and most eminent Ministers," and 4 volumes, entitled "Analecta; or, a History of Remarkable Providences," have been printed by the Maitland Club. Three volumes of his correspondence were published by the Wodrow Society—a literary club called after his name, and instituted in 1841 for the publication of the works of the fathers and early writers of the Reformed Church of Scotland. This correspondence, which extends from the year 1709 to the year 1781, throws much light on the ecclesiastical history of the time, and contains letters addressed to persons of some note in their day, not only in Scotland, but in England, Ireland, and North America. W.'s health was impaired by the eagerness with which he prosecuted his laborious studies. He died on the 21st of March 1784, in the 55th year of his age. His great work—the one by which his name is generally known—is the history. It is what it professes to be in the title-page, a "History of the Sufferings" of the Presbyterian Church, rather than an ecclesiastical history of the period. This of itself implies a one-sided character, and warns its readers that they need not expect an account of events not coming within its limited range. Of its great value as a storehouse of materials to the student of Scottish history, no one who has examined its pages can have a doubt. As little hesitation will there be in regard to the absence of every grace of style. The only question will be as to the degree of credit to be given to the facts which the writer relates. So far as concerns his fidelity in transcribing records, and incorporating in the text the narratives furnished to him there is no reason to doubt his general accuracy. But beyond this nothing can be said. His credulity was so great as to make him entirely unable to give any weight to intrinsic improbabilities or the conflict of external evidence. He could rarely admit a fault in those of his own side, and it is hardly an exaggeration to say that he could never see a virtue in his opponents. Much of his history is gathered from the records of the Privy Council of Scotland, and an examination of these valuable and voluminous papers will make it pretty evident that W. disingenuously neglected to extract particulars which tell against his party. It is obvious, therefore, that in the perusal of his work, allowance must be made, not only for the absence of whatever does not come within its proper subject, but also for exaggerations of the virtues and sufferings of one party, and the crimes and errors of the other. The fullest memoir of W. is that which is prefixed by Dr Burns to his edition of the history. Interesting details of his domestic life and of his labors and studies will be found in the printed volumes of his correspondence.

WOJWODA (Polish, *Wojewoda*), an old Slavonic word (composed of *wot*, warrior, and *wodit*, to lead), means, literally, army-leader or general, and was from early times used by most Slavonic nations in this sense. Afterwards, it became the title of the elective princes before hereditary monarchies were formed. Thus, at one time, the princes of Walachia and Moldavia were called Wojwodes; from the Greek emperors, with whom they had been in intimate alliance from the year 1439, these princes next received the title of Despots, a title they afterwards exchanged for that of Hospodar. The name was also given to the elective princes of Transylvania, whether dependent or independent. The same title of Wojwoda was applied to the elective chiefs of the Polish government before the beginning of the Piast dynasty. Later, the name denoted office and dignity; and was given, in the former kingdom of Poland, to the governors in the districts, or Wojwodschafts, into which the kingdom was divided. They had at first only a military authority; afterwards, however, both the civil and military were united in one person, so that Wojwoda and Palatine were one and the

Wojwodschaft
Wolf

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same. The name of Wojwodschaft was preserved in Russian Poland till recent times; now the Polish Wojwodschafts are named uniformly with the other Russian "governments."

WOJWODSCHAFT, (or Wojwodina) of Servia. See BANAT.

WO'KINGHAM or Oakingham, a small but improving market-town of Berks, 7 miles south-east of Reading, at the junction of the Reading and Statue and the Reading and Guildford Railways. Shoes are made, and gauze and silks woven. In the original Rose Inn, Gay, Swift, Pope, and Arbuthnot, being detained here by wet weather, composed among them the old song of "Molly Mog." All Saints' Church, a magnificent building, lately restored, is remarkable for its massive chalk pillars. W. is the only town in Wiltshire Forest. The ancient amusement of bull-baiting was continued here until within the last 30 years. Pop. (1851) 2272; (1861) 2404; (1871) 2868.

WOLCHO'W, or Volkhov. See ILMEN, LAKE, and LADOGA, LAKE.

WOLCOT, Dr John, better known under the pseudonym of *Peter Pindar*, was born at Dodbrooke, in Devonshire, in 1738. He was educated at the charge of his uncle, a respectable surgeon and apothecary of Fowey, in Cornwall. After studying medicine at the London hospitals, he accompanied Sir William Trelawny to Jamaica in the capacity of medical attendant; but finding his professional income too small for his wants, he solicited and obtained a church-living in the island. His congregation consisted mostly of negroes, and Sunday being their principal holiday and market, the attendance at church was very limited. Sometimes not a single person came; and W. and his clerk—the latter being an excellent shot—used at such times, after waiting for ten minutes to proceed to the seaside, to enjoy the sport of shooting ring-tailed pigeons. The death of his patron, Trelawny, induced him to abandon both Jamaica and the church. Returning to England, he tried to establish himself as a physician at Truro, in Cornwall, but does not appear to have succeeded. At any rate, he soon removed to London, where he gave himself up to writing audacious squibs and satires in verse, on all sorts of persons, from King George III. down to the livermen of London, and even lower. W.'s line in literature is not a very respectable one, and most people would probably prefer obscurity to a reputation like his; but, to do him justice, Peter Pindar is an excessively clever writer. Unscrupulous, impudent, and coarse, he is yet a master of burlesque humor and comic caricature; his verse is easy, vigorous, and idiomatic; and his fancy rich in the production of ludicrous metaphor. Two of his racker pieces, levelled at his sovereign, are "The Apple-dumplings and a King," and "Whitbread's Brewery Visited by their Majesties." Besides these, we may mention his "Lyrical Odes" on the Royal Academy Exhibition (the earliest of his London efforts, and dating from 1792); "Bozzy and Plozz, or the British Biographers;" "Peep at St James's;" "Epistle to a Fallen Minister;" Odes to Mr Paine;" and the "Lonsiad, a Hero-comic Poem," in five cantos; &c. The "Lonsiad" has its foundation in the fact, that an obnoxious insect had been discovered in the king's plate among some green peas, which produced a solemn decree that all the servants in the royal kitchen were to have their heads shaved. Some of W.'s serious effusions actually possess considerable merit. If the matter, or rather the themes of his verse, had been less worthless, it would have stood a better chance of permanent popularity. In his own lifetime, his pieces were greedily read, and he had an annuity from the booksellers of £350 for the copyright of them. He was considered so formidable a personage, that the ministry are said to have endeavored to bribe him into silence. W., who records this proof of his power, also asserts the incorruptibility of his patriotism. He died 14th January 1819.

WOLF, Frederick Aug., the most gifted classical scholar and first critic of his age, was born 15th February 1759, at Haynrode, near Nordhausen. He was brought up and educated with great strictness by his father, the leader of the choir and organist of the place; but was afterwards sent to the gymnasium at Nordhausen. Here, under the training of the rector Hake, were developed in him not only that restless ardor for the thorough study of the ancient languages which actuated him throughout life, but also, what was afterwards the predominating

trait of his character, the habit of inquiring and judging for himself, and of pursuing only one object at a time. Before leaving the gymnasium for the university, he had read the principal ancient authors, as well as the French, Italian, Spanish, and English; and had also perfected himself in the theory and practice of music. At the university of Göttingen, which he went to in 1777, with the intention of studying philology exclusively, he attended the lectures very irregularly, being already much given to private study. For the rest he lived very retired, was little visited or known, and was only intimate with a few. However, he gave lessons to several students in Greek and also in English, for which he published Shakespeare's "Macbeth," with explanatory notes (Göttingen 1779). From Heyne (q. v.), who had once excluded him from hearing a course of lectures on Pindar, on account of the irregularity above noticed, he kept himself quite aloof. In order, however, to commend himself to a man who had so much influence as Heyne had, he laid before him, shortly before his departure in 1779, a dissertation, containing some novel views regarding the Homeric poems; which, however, Heyne coldly returned. In the same year he went as teacher to the Pädagogium at Ifeld, and there first established his fame by an edition of the "Symposium" of Plato, with notes and introduction in German. In 1782, he was appointed to the rectorship of the High School at Osterode, in the Harz; and, in 1783, accepted an invitation to Halle, as professor of philosophy and of pedagogical science. In Halle, W. had at first difficulties to encounter, as he rather estranged than attracted students by the high tone of his teaching. However, he soon learned to adapt himself to his audience, and then the crowd of eager pupils was very great. As academical teacher, he went on the principle that classical antiquity should be looked upon chiefly as serving for a model of what is noblest and greatest in public and private life, and as such, is to be employed as a medium of education. He made it the principal duty of his office to provide able teachers and superintendents for the schools of his native country, and to deliver education, as much as possible, from the scientific pedantry of the old school of pedagogues. Literary labors and fame he looked upon more as a subordinate object; and his effectiveness as a teacher was unparalleled during the twenty-three years he lived at Halle. He nevertheless established his reputation as a scholar and critic by an edition of Demosthenes's "Oratio adversus Leptinem" (1789), which attracted much attention, and still more by his celebrated "Prolegomena ad Homerum" (1796), in which he unfolded with prodigious learning and acuteness, his bold theory, that the "Odyssey" and "Iliad" are composed of numerous ballads or rhapsodies by different minstrels, strung together in a kind of unity by subsequent editors (see HOMER). This work made a great sensation through the whole of Europe. Some scholars gave out that they had long entertained similar notions regarding the Homeric poems; and Heyne insinuated that the Prolegomena were only a reproduction of what W. had heard at Göttingen. This gave rise to the spirited "Briefe an Heyne" (Letters to Heyne, Berl. 1797), of which the first three may be considered as models of scholarly polemic and fine irony. Some years afterwards W. published the text of the four orations of Cicero, whose genuineness had been called in question by Markland in England—namely, "Post reditum in Senatu," "Ad Quirites post reditum," "Pro domo sua ad pontifices," "De haruspicii responsis"—appending the previous controversy, and adding striking observations of his own in proof of their spuriousness. He next went still further, and attacked the authenticity of the oration "Pro Marcello," which had long been studied by the Ciceronians as a model of eloquence and style, pronouncing it to be mere inflated declamation, in a diction hardly Latin, and which Cicero never could have written. This audacious scepticism produced no little alarm. After having refused a call in 1794 to Leyden, in 1798 to Copenhagen, and in 1805 to Munich, his position was considerably improved, and he received the title of Privy-councillor. After the disasters of 1806, the university at Halle was dispersed, and W. was for a time reduced to great straits. However, he soon found a suitable position as member of the Academy of Sciences at Berlin, where he took an active part in the reorganization of the university, and became a professor. He was taken into the Ministry of the Interior as member of the section for public instruction; but, finding that the duties interfered with his time and strength for teaching, which he considered his mission, he continued only a short time in public office. He next gave up the work of an ordinary professor, and reserved at last only the privilege of lec-

turing in the university on such subjects as he chose. For the benefit of his health he took a journey to the south of France in April 1794, and died at Marseilles, 8th August 1824. The multitudinous works of W. we cannot attempt to enumerate. They consist chiefly of critical editions of classical writings, with dissertations and annotations, and often with admirable translations either in German or Latin.—While in Berlin he edited, along with Buttmann, the "*Museum der Alterthumswissenschaften*" (1807–1810), and afterwards the "*Literarische Anzeiger*" (1817–1820), which has been pronounced perhaps the best philological journal that has ever been published, and which contains, among other papers by W., a long notice of Richard Bentley. From the papers which he left, his son-in-law, Körte, published "*Ideen über Erziehung, Schule und Universität*" ("*Ideas on Education, School and University*;" Quedlinb. 1835).—See Hanhart, "*Erinnerungen an Fr. Aug. W.*" (Basel, 1835); Körte, "*Leben und Studien Fr. Aug. W.'s des Philologen*" (3 vols. Essen, 1833); Gottholdt, "*Fr. Aug. W., die Philologen und die Gymnasien*" (Königsb. 1843).

WOLF, Johann Christian von, a celebrated philosopher and mathematician, was born in 1697, at Breslau. His father, a rather poor but well informed artisan, made it his chief object to give a good education to his son, who at an early age shewed excellent abilities. W. received the elements of his education at the gymnasium of Breslau, and went to Jena in 1699 to study theology. However, mathematics and philosophy were his favorite sciences, and to them he almost exclusively devoted himself. In particular, he studied Descartes and Trichirhausen's writings, to whose "*Medicina mentis*" he wrote annotations, which brought him into connection with Leibnitz. In 1708, he delivered at Leipzig a graduation dissertation, "*De Philosophia Practica Universal, Methodo Mathematica Conscripta*," which made a very favorable impression, and then began to give lectures in mathematics and philosophy, which were very numerous attended. By various works which he published on special branches of mathematics, his name became celebrated even in foreign countries. When the invasion of Charles XII. into Saxony obliged him to leave Leipzig, he received, on the recommendation of Leibnitz, a call to Halle, as professor of mathematics and natural philosophy. He there acquired great celebrity by his numerous mathematical writings. The clearness and definiteness of the ideas and propositions which he exhibited in his mathematical lectures, were something till then quite unknown. Hence it came that his system of metaphysical and moral philosophy, which he worked out according to this mathematical method, and published, met with universal approbation, and quickly spread through Germany: it became a kind of rage to treat all sorts of subjects in the mathematical method, the effect of which was often ludicrously pedantic. W., however, was violently attacked by his colleagues in Halle, especially by those theologians who favored the pietism then coming into vogue: he was declared to be a despiser of religion, and a teacher of error; and a formal accusation was brought against him to by government. The immediate ground of the accusation was his oration "*De Philosophia Sincensium Morali*," in which he spoke with approval of the morality of Confucius, besides which the basest insinuations were brought against him, derived from his doctrine of freedom, which, it was said, encouraged social anarchy. By a cabinet order of Frederick-William I. of date 15th November 1723, W. was deposed from his office, and commanded under pain of death, to quit Halle, in 24 hours, and the Prussian dominions in two days. He did so on the 23d November, and met with a favorable reception in Cassel, and was appointed to a chair in the university of Marburg. The dispute about his philosophical system now became general, and nearly the whole of Germany took part either for or against him. At the same time he received from abroad many marks of honor and advantageous proposals, which last, however, he declined. In the meantime the Prussian government had begun to regret the steps it had been led to take against him, and had appointed a commission to re-examine the matter. This resulted in his entire justification; and when Frederick II., who had a great esteem for him and had studied his system, ascended the throne (1740), W. was induced to return to Halle as Professor of the Law of Nature and Nations, and with the titles of Privy-councillor and Vice-chancellor. In 1748, he became Chancellor in the place of Ludwig, and was raised to the rank of Baron of the Empire by the Elector of Bavaria during the regency. W. died in 1764. Before his

death, he saw his philosophy spread over the whole of Germany and a great part of Europe; he had, however, outlived his reputation as an academical teacher. That he did great service to philosophy, cannot be denied. If he did not enrich it by great and brilliant discoveries, he at least directed attention to systematic method; and by treating scientific subjects in the mother tongue, he did much to create that wide-spread taste for philosophical speculation which has since been characteristic of Germany. W. adopted Leibnitz's hypothesis and principles, which he endeavored to carry out into a complete system and popularise. But although the Wolfian philosophy was a great improvement on the scholastic Aristotelianism that had previously prevailed, its dogmatism could not stand the criticism of Kant, and it is now a theory of the past. By his voluminous writings, written partly in the German language, and the immense number of his pupils, W. had a wide and beneficial influence on his age, more especially as counteracting pietism and mysticism, then rampant. He also did good service to the German language. The multitude and extent of his writings is truly marvellous, even if we look at nothing else than the mechanical labor of writing them. He treated mathematics and philosophy in a double set of works; the one in full in Latin, the other shorter as German school-books, of the most of which several editions have been published. Besides these, are a great number of treatises on single subjects in physics, mathematics, and philosophy. His systematic works on all the chief branches of philosophy alone, amount to 22 vols. in quarto.—See "Christian W.'s eigene Lebensbeschreibung" ("Christian W.'s Autobiography," published by Wuttke (Leip. 1841); Ludovici, "Sammlung und Auszüge der sämtlichen Streitschriften wegen der Wolfischen Philosophie," n. s. w. ("Collections and Extracts of the Controversies about the Wolfian Philosophy," &c., 2 vols. Leip. 1757); by the same author, "Ausführlicher Entwurf einer vollständigen Historie der Wolfischen Philosophie" (3 vols. Leip. 1757).

WOLF (corresponds to Lat. *vulpes*, a fox), the name of a wild animal of the same genus with the dog, and of which it is indeed doubtful if it constitutes a distinct species; whilst, as to the different kinds of wolves found in different parts of the world, it must be deemed at present wholly uncertain whether they are to be regarded as species or varieties, although they have, provisionally, received specific names. There exists among them the same close resemblance as in the different kinds of dog, with a similarly marked distinction of characters, which, however, it is difficult to state; as specific characters are generally stated. The same difficulty, therefore, occurs in the natural history of wolves as in that of dogs, although the number of different forms is not so great. In their most important characters, and those which are least subject to variation, are generally regarded as best marking specific distinction, they agree not only with each other, but with dogs. The opinion, that the W. is the parent of the dog, or of some of the kinds of dog, is favored by the identity of the period of gestation, a point which seems to be pretty well established, and which, in such a question, is to be regarded as of great importance. Dogs and wolves, also, litter mix, but it is not yet fully ascertained that the offspring will continue fertile among themselves. It is further observed that wild races of dogs, whether originally wild, or having become wild (*feral* races), resemble wolves in many respects, in their dull uniformity of color, in their lengthened muzzle, lengthened limbs, lank form, and gaunt aspect, and even in the bushiness of the tail. It has been alleged, as a reason against supposing the W. and the dog to be really of the same species, that the W. is incapable of domestication and of attachment to man. This, however, is not the case. Both the Common W. of the Old World and the wolves of America have been found capable of domestication, when taken young, and instances are on record of their having displayed an attachment to their master like dogs.

The Common W. (*Canis lupus*) inhabits Europe and the northern parts of Asia, its range extending from the Arctic regions as far south as the northern parts of Africa and of India. It is of a yellowish or tawny-gray color, with strong coarse hair, which is longest on the ears, neck, shoulders, and haunches, but particularly on the throat; the muzzle is black, the upper lip and chin white. The ears are erect and pointed, the muzzle sharp; the legs rather longer than those of the Shepherd's Dog; the tail bushy, but not curling; the eyes oblique, giving a peculiar vicious expression to the countenance. The W. is swift of foot, and hunts deer and other animals,

packs of wolves associating for this purpose; it also often commits great ravages among sheep, and attacks calves, but seldom full-grown oxen. It seldom attacks man, unless hard pressed by hunger, when it becomes very dangerous. The hungry wolves which sometimes descend, in severe winters, from the forests of the Alps, Pyrenees, and other mountains, are much dreaded by the inhabitants of neighboring regions; and terrible stories are told of travellers chased by packs of wolves in the forest-covered plains of the east of Europe and in Spain. In general, the W. is cowardly and stealthy, approaching sheepfolds and farm-buildings by night, in search of prey, and readily scared by any demonstration of watchfulness, fleeing from dogs, and not readily exposing itself within range of shot. It defends itself, however, with great vigor, when compelled to do so. It is not easily trapped, being extremely cautious, and appearing to understand the nature and purpose of a trap almost as well as those by whom it is set. Wolves have often been known even to approach a trap so skillfully as to devour the bait without harm to themselves, getting at it from below.

Diversities appear in the wolves of different countries of Europe and Asia, but not very considerable. The French wolves are generally browner, and rather smaller than those of Germany; the wolves of Russia are larger, and have longer hair; the wolves of the Alps are brownish-gray, and not of large size; in Italy and Turkey a tawny color predominates. In some very northern regions, wolves become white in winter; and white wolves, probably albinos, sometimes occur in more southern regions. The Black W. is the most marked European variety. It is found in the Pyrenees and in Spain, and is very large and strong. Strings of mules are often followed by these wolves in the passes of the Pyrenees, after evening comes on, and they not infrequently succeed, notwithstanding all the care of the muleteers, in capturing some of the animals.

Wolves are still very plentiful in some parts of Europe. An official report of the Russian government concerning the district of Livonia, for the year 1832, states that the wolves in that district of about 20,000 square miles, destroyed in that year 1841 horses, 1807 oxen, 783 calves, 15,182 sheep, 726 lambs, 2545 goats, 133 kids, 4502 swine and pigs, and 703 dogs, besides geese and fowls. The W. was formerly common in Britain, and the Anglo-Saxon name for January, *Wolf-month*, is significant of this fact. Places of refuge from wolves were erected for travellers in wild and unpeopled districts, as at Flixton in Yorkshire. King Edgar committed the punishment of criminals on their producing a certain number of wolves' tongues. Lands in Derbyshire were held on condition of killing wolves. It is not easy to say at what date wolves ceased to exist in England; it was probably about the end of the 16th c., but they continued to commit serious ravages on flocks, in Scotland, in the end of the 16th c., and the last W. in Scotland is said to have been killed by Sir Ewen Cameron of Lochiel, in 1680. They existed in Ireland at least as late as 1710.

The American wolves are very similar to those of the Old World. They have been described as forming several distinct species, but are by some included in one, doubtfully distinguished from the Common W., and to which the name *Canis occidentalis* is given. The fur is thicker, and the form more robust than in the Common W., the muzzle is less pointed, and the profile not so straight; the legs and ears are shorter, and the tail is more bushy. The GRAY W. (*Canis occidentalis*, var. *griseo-albus*, or *C. griseus*) is abundant in the northern parts of North America, except in the long-settled districts, from which it has been expelled by man. It is the only kind found in Canada. A few still remain in the mountainous and wooded parts of New England. Packs of wolves hang around the herds of buff does (bisons) on the western prairies, not daring to attack strong animals, but ready to seize any sickly straggler that falls behind the rest. They hunt and run down deer. The Gray W. equals the European species in cunning, and has been known to bite off the cord close to the trigger of a set gun, and afterwards to devour in safety the bait placed before the muzzle. It has also been known to haul up fishing-lines set in a hole of the ice, and to help itself to the fish. It is frequently taken by means of pitfalls. On the prairies, the Indians kill great numbers of wolves by enclosing them in a circle gradually reduced, but originally extending over many miles. A premium of 10 to 20 dollars a head was formerly paid, in some parts of America, for the destruction of wolves, partly by the state, and partly by the county or town, because of their ravages among sheep. The range of the Gray W. extends to the coldest

northern regions, as Melville Island and Banks's Land. In the north-western states, the Gray W. gives place to the Dusky W. (*Canis nubilus* of many naturalists); and in the south is the Black W. (*C. ater* or *Lycaon*); whilst on the upper parts of the Missouri, the White W. appears, and the Rufous W. in Texas. They differ little in characters and habits from the Gray Wolf.—The PRAIRIE W. (*C. latrans*, or *Lycaeus latrans*), the Coyote of the Mexicans, is a very different animal, more resembling the jackal. It is found from Mexico northwards to the Saskatchewan, abounding on the vast plains of the Missouri. It is 36 to 40 inches long, with a tail of 16 or 18 inches; the muzzle sharp and fox-like, the ears very large and erect, four toes on each foot, and on the fore-feet a sharp claw on the inside, two inches above the ground, attached to the rudimentary thumb; the color is usually dull yellowish gray, with black cloudings, the under parts dirty white. It hunts in packs. It is an extremely fleet quadruped, excelling every other in the countries which it inhabits, except the Prong-horn. Its voice is a kind of snapping bark. The true wolves never bark, the only sound they emit being a prolonged and dismal howl.

South America has numerous species of *Canide*, some of which are known as *Aguana* wolves, and are nearly allied to the Prairie Wolf.

WOLF-DOG, a kind of dog used for hunting the wolf, formerly abundant in Norway and Sweden, but now almost exclusively found in Spain, into which it is supposed to have been introduced by the Goths. It is of the same group with the Shepherd's Dog; and is of a large size, little inferior to the mastiff, with pointed nose, erect ears, long silky hair, and a very bushy tail curled over the back. In color it is mostly white, with large clouds of tawny color or brown.

WOLFE, The Rev. Charles, the son of a country gentleman of Kildare, was born on 14th December 1791, at Dublin. The family having come to England on the death of his father, which took place whilst he was yet quite young, the boy received his chief education at Winchester, where he shewed himself an apt scholar. Being transferred, in 1809, to the university of Dublin, he succeeded in securing a scholarship, and in 1814 his degree of Bachelor of Arts. During this period, he was actively employed as a tutor: at this time it was also that he composed the greater part of the poetry which he left as his legacy to the world. In 1817, his celebrated lines on "The Burial of Sir John Moore," suggested by reading Southey's impressive account of it in the "Edinburgh Annual Register," were written; and soon after, they found their way into the newspapers. So generally admired were they, that even whilst the name of their author remained unknown, they had won for themselves a secure place in the memory of the British people. As a singularly felicitous and touching poetical record of a noble and pathetic incident in our national history, they are perhaps not likely to be forgotten whilst that history is patriotically read and remembered. W., after qualifying himself to take orders, became, in 1817, curate of Ballyclog, in the county of Tyrone, from which he was shortly transferred to the larger parish of Donaghmore. His devotion to his duties was extreme, and was repaid by the warm affection of all with whom they brought him in contact. But they seem somewhat to have overtaken the strength of a constitution at no time robust; symptoms of consumption appeared; and a visit which he made to Edinburgh in May 1821, developed it. He tried in search of health, successively England, the south of France, and finally the sheltered Cove of Cork, in which last place he died on 21st February 1823.

His literary "Remains," consisting of sermons chiefly and poems, were given to the world, with a Memoir, in 1823, by the Rev. John A. Russell, M.A., archdeacon of Clogher, an attached friend of the deceased. The work, though containing some poetry of real merit, never made any great impression, and is now quite forgotten. The one beautiful piece which preserves for us the name of W., was attributed by guess, whilst he lived, to more than one of the most famous writers of the day—as, notably, Campbell and Byron. Since his death, several notorious attempts have been made to flish from him the fame he continues to derive from it.

WOLFE, James, the most famous English general of his time, was born at Westerham, in Kent, on 2d January 1727. His father was a lieutenant colonel, afterwards General Wolfe, an officer of merit and distinction, who served under Marlborough and Prince Eugene. Along with his brother Edward, who was about a year younger, James received his first education at a small school in that neighbor-

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hood. From the first the boy had resolved to follow his father's profession of arms; and, when little more than 13 years old, he started to accompany the colonel as a volunteer in the unfortunate Carthage expedition. An attack of illness, however, made it necessary to put him ashore at Portsmouth just before the fleet sailed. In 1742, he received his commission as ensign in the 12th, or Colonel Durocre's Regiment of Foot, with which he was soon after embarked for service in Flanders. In the year following, he took part in the famous battle of Dettingen; and it is evidence of the capacity he already began to display, that we find him, though still the merest boy, acting in the responsible capacity of adjutant of his regiment. After the battle of Fontenoy in 1745—at which W., who had now become a captain in the 4th, or Barrell's Regiment of Foot, was, notwithstanding a current tradition to that effect, certainly not present—the British troops were withdrawn from Flanders to assist in the suppression of the rebellion at home. With the army in Scotland he served in the capacity of brigade-major, and was present at the battles of Falkirk and Culloden. In 1747, he was again abroad on service. At the battle of Laufeldt, he was wounded, though not seriously; and his conduct was so distinguished that he was publicly thanked by his commander-in-chief, the Duke of Cumberland. In the beginning of the year 1749, he was appointed major of the 20th Foot, then stationed at Stirling, whither he proceeded. In the absence of the colonel, the command of the regiment devolved upon him. In this responsible position, which was rendered much more trying by the disaffection still prevalent, young as he was, W. conducted himself with admirable tact and discretion. With little interruption, he remained in Scotland till the end of 1753, when the regiment returned to England. From the tone of his correspondence, it is evident he was not greatly delighted with Scotland or its inhabitants. In the mismanaged expedition against Rochefort in 1757, W. was appointed to act as quartermaster-general of the force. The total failure of the operations brought disgrace to nearly all concerned; but it became sufficiently known that, had W.'s prompt and daring counsel been followed, the result would have almost certainly been different; and his reputation, already a brilliant one, rose considerably in consequence. In particular, it appears that the attention of Pitt was now first decisively drawn to him as an officer of whom in any enterprise intrusted to him, great things might be expected. As marking approval of his conduct, the full rank of colonel was conferred on him. The high opinion thus formed of him, was signally confirmed the year following, when he was intrusted with the command of a brigade in the expedition against Cape Breton, under General Amherst. A great success was obtained in the capture of Louisbourg; that it was mainly due to W.'s skill, boldness, and activity was quite clearly understood, and he became popularly known as "the Hero of Louisbourg." Presently came the opportunity which was to consummate his glory, in the instant of heroic death. Pitt was now organizing his grand scheme for the expulsion of the French from Canada; it was his just boast that he "sought for merit wherever it was to be found;" and the expedition, which had for its object the capture of Quebec, the enemy's capital, he confided to the care of W., allowing him, as far as possible, a *carte blanche* for the choice of his subordinate officers. On 17th February 1759, W. advanced to the rank of major-general, and commanding an army of between 8000 and 9000 men, set sail from England. At Louisbourg, he had news of the death of his father, the state of whose health had for some time been such as to prepare him for the event. On the 26th June, W. landed his forces on the Isle of Orleans, opposite Quebec, and proceeded to concert his plans for the attack upon it. This, of which he had shortly before written as likely to be found "a very nice operation," provided, on a closer examination, to be one of stupendous, and, indeed, nearly hopeless difficulty. The system of defence adopted by his adversary, the skilful and wary Montcalm, was such as to offer him no point of advantage. In all his attempts, though seconded most ably by Admiral Saunders, who commanded the fleet, he found himself completely foiled. The season wore fast away during which operations could be continued; and an abortive result seemed imminent of the expedition from which so much had been hoped. But at last, at day-dawn of the 13th September, he found himself at the head of his little army, on the Heights of Abraham, above the city, where Montcalm, sorely against his will, was forced to risk decision of the struggle by battle in the open field. Resolving to make all on a final effort,

W. had, during the night, succeeded in scaling the cliffs at a point insufficiently guarded—an operation of such frightful risk and difficulty, as in war has scarcely a parallel. Of victory he had no doubt; his little force, now—exclusive of detachments necessarily left behind—reduced to something like 5000 men, was indeed opposed to near 8000 of the enemy, besides Indian auxiliaries; but of these it was well known that only a part could be depended on as trained and veteran troops. The result justified his confidence; after a short struggle, the enemy was driven from the field in complete rout; the capitulation of Quebec followed some days after; and its fall decided the fate of Canada. But W. did not live to reap the fruits of his victory; he died in its very hour. In person he led the right; twice wounded, he refused to leave the front; a third bullet prostrated him; and he was carried, plainly dying, to the rear. He lived only long enough to know that the battle was decisively won; then rallying his last strength to give one final order, and saying: "Now God be praised! I die in peace," he expired. The gallant Montcalm also fell, paying with almost his last breath, the tribute of a true soldier to the valor of the troops who had beaten him: "Since," said he, "it is my misfortune to be discomfited and mortally wounded, it is a great consolation to me, to have been vanquished by so brave an enemy. If I could survive, I would engage to beat three times the number of such forces as mine were, with a third of British troops."

The news of the victory was received in England with a tumult of exultation, dashed with grief for the loss of the hero to whom the nation owed it. When parliament met in November, the House of Commons addressed the king, praying that his Majesty would order a monument to be erected to the memory of the dead soldier in Westminster Abbey; where, accordingly, an *effigies* of him may be seen, with allegorical adjuncts as tasteless and absurd as usual. He was buried beside his father, in the family vault under the parish church at Greenwich.

A single military achievement, however brilliant, cannot be made ground of a claim for the successful soldier to take rank as a great captain. But that W. had the true genius for command, which needed only time and further opportunity to win for him a fame still more splendid, is scarcely permitted us to doubt. Through the lower regimental grades he rose rapidly by sheer force of personal merit, at a time when the service was a mere hotbed of corruption; and on attaining to higher commands, he in every instance gave evidence of the higher military qualities which proved him eminently worthy of them. He had only reached the age of 33, when in his last, and properly his one great achievement, he died, seemingly cut off in the mere opening of a brilliant career. He was of warm affections, and frank and generous nature; though his temper was somewhat eager, impulsive, and irascible. Few men have ever been more generally loved; and not many men so famous have left behind them a memory in every way so pure and spotless.

Till lately, no memoir of him in the least adequate existed; but in "The Life of Major-general James Wolf—founded on Original Documents, and illustrated by his Correspondence," by Robert Wright (Lond. Chapman and Hall, 1864), the want is now competently supplied.

WOLFENBÜTTEL, a very old town of Brunswick, stands in a low marshy district on both banks of the Oker, 7 miles south of Brunswick by railway. Its old fortifications have been converted into promenades. There are several churches, schools, charities, and a college. In a handsome building formed after the model of the Pantheon at Rome, is the famous library placed here in 1644, of which Lessing was sometime librarian. It consists of nearly 270 000 volumes, and upwards of 10,000 manuscripts, and contains some of the finest miscellanea in Europe, an immense collection of Bibles, including Luther's Bible with autograph notes. In the same institution are preserved the great Reformer's marriage-ring, spoon, drinking-glass, and portrait by Cranach. The cultivation of vegetables is carried on to a great extent, and there are manufactures of lacquered and japanned wares, paper-hangings, leather, tobacco, and fagons; a trade in corn, cattle, and linen-yarn. W. has five annual fairs. Pop. (1871) 10,457.

WOLFENBÜTTEL FRAGMENTS. See LESSING; REIMARUS.

WOLFFIAN BODIES, important organs in the vertebrate embryo, in which they serve only a temporary purpose, except in the lowest class (the fishes), where they

remain permanently. In the development of the chick, these bodies may be seen as early as the fourth day, lying along either side of the vertebral canal, from the region of the heart downwards and backwards, and consisting of a series of cæcal or blind appendages, corresponding with the so-called kidneys of fishes, which in reality are true persistent Wolffian bodies. On the fifth day, the appendages become convoluted, and the body which they collectively form increases in mass. The appendages are then seen to possess a secreting property, and the fluid which they secrete is conveyed by the duct of each side into the *allantois*, a sac which, at the same time, acts as a temporary respiratory organ, and is also used as a urinary bladder. Hence these organs may be regarded in the light of temporary kidneys. In the chick, the true kidneys begin to form from the Wolffian bodies at the fifth or sixth day, and gradually increase in size as the temporary organs diminish; and at the end of foetal life, only a shrunken rudiment of them can be observed. In man, the process is very similar, the Wolffian bodies beginning to appear towards the end of the first month; while in the seventh week, the true kidneys first present themselves. From the beginning of the third month, the Wolffian bodies begin to decrease, the kidneys increasing in a corresponding ratio, and at the time of birth, scarcely any traces of the former can be seen. It was formerly believed that the essential parts of the generative apparatus—the testes in the male and the ovaria in the female—were also developed from these bodies; but this is not the case, as they have an independent origin in a special mass of blastema peculiar to themselves, in the immediate vicinity of the Wolffian bodies.—See Carpenter's "Principles of Human Physiology," 6th ed., p. 810.

WOLFFIAN BOTTLES, the name given to a set of apparatus employed for the distillation of Hydrochloric Acid (q. v.). It consists of a retort, in which chloride of sodium (common salt) is submitted to the action of sulphuric acid, gradually added through the funnel, and the vapor evolved passes out into the first bottle, and is absorbed by the water. This process continues till the power of absorption of the water in the first bottle ceases (or, in other words, till the water becomes *saturated*), when the vapor collects in the neck of the retort and in the tube, till it acquires sufficient tension to force its way through the water, and enter the second bottle by a tube. In turn, the water in the second bottle becomes saturated, after which the gas is forced to find its way into the third bottle through the other two by means of a connecting tube. After the force of reaction in the retort has become weakened, the evolution of the gas is quickened by the application of a flame, which requires to be gradually increased. Considerable heat being generated during absorption, it is desirable that the bottles should be immersed in cold water. Tubes admit atmospheric air to prevent the rarefaction in the retort tending to force the contents of the bottles back into it.

WOLF-FISH (*Anarrhichas*), a genus of fishes of the family *Blenniidae* (see **BLENNY**), having no ventral fins, the pectorals very large, a single dorsal fin extending from behind the head almost to the tail fin, a long anal fin, the tail-fin rounded; the head round, smooth, and blunt; the teeth large and strong, not attached immediately to the jaws, but to bony processes connected with them by sutures. The jaws are powerful the front-teeth resemble the canine teeth of mammals, whilst the vomer and palate are furnished with teeth which have the form of rounded tubercles. One species, the **COMMON W.**, also called **CAT-FISH** and **SEA-CAT** (*A. lupus*), is found on the coasts of Britain, and is plentiful in more northern seas. It is frequent on the coasts of Scotland, particularly in the north, but is more rare on the English coasts. It is of a light gray color, brownish on the back; the lower parts exhibiting ten or twelve dark transverse stripes. The skin is covered with much slime. It attains the length of six feet, and is a creature of formidable and even repulsive appearance, it bites savagely when caught, and fishermen therefore generally despatch it as soon as possible by knocking it on the head. It preys chiefly on molluscs and crustaceans, which its jaws easily crush. It is often very destructive to nets, being an active and powerful fish. Notwithstanding its ugliness, it is in esteem for the table, and it is often brought to the Edinburgh market. It is much used in Iceland, both fresh and salted; and a kind of shagreen, used for bags and ponches, is made of its thick skin. A very similar species, *A. vomerinus*, is found on the American coast

from New York to Greenland, and is not only used fresh, but also split, salted and smoked.

WO'LFRAM is a native compound of tungstate of iron and manganese, from which the metal Tungsten (q. v.) is usually obtained.

WOLF'S-BANE. See **ACONITE**.

WO'LGAST, a commercial town and seaport of Prussia, in Pomerania, stands on the Peene, about 10 miles from its entrance into the Baltic, and 83 miles south-east of Stralsund. The shallowness of the water admits only the smaller class of sea-going vessels entering the harbor. There is a public dockyard and a school of navigation; and the inhabitants, who number (1871) 6203, are occupied in shipbuilding, seafaring, and in the manufacture of candles, soap, and tobacco. The larger ships discharge and take in cargoes at Radeu, a small island and pilot-station opposite the mouth of the Peene, known as the landing-place of Gustavus Adolphus in 1630. W. is a very old town; it was strongly fortified as early as the 12th c., and was once the residence of the Dukes of Pommern-Wolgast; it was taken and retaken five times between 1633 and 1675; the Russians plundered and burned it in 1713, and the Swedes retook it in 1716.

WOLLASTON, William Hyde, M.D., a distinguished physicist, was the second son of the Rev. Francis Wollaston, of Chislehurst, in Kent, and was born August 6, 1766. After the usual preliminary education, he was entered of Caius College, Cambridge, where he studied for the medical profession, and took the degree of M.D. in 1793, in which year, also, he was elected a Fellow of the Royal Society. After practising as a physician at Bury St Edmunds, he removed to London; but being beaten by Dr Peimberton in a competition for the post of physician to St George's Hospital, he determined thenceforth never to write a prescription, "were it for his own father," but to devote himself wholly to scientific investigation. This sudden resolution proved ultimately most beneficial, leading him rapidly to wealth and fame; for unlike many eminent investigators of nature's laws and phenomena, W. combined "the genius of the philosopher with the skill of the artist," and succeeded in making industrial application of several of his important discoveries. His researches were prosecuted over a wide field, but were pre-eminently fruitful in the sciences of chemistry and optics. To the facts of the former science he added the discovery of new compounds connected with the production of gouty and urinary concretions, such as phosphate of lime, ammonio-magnesian phosphate (a mixture of these two forming the "fusible" calculus), oxalate of lime, and cystic oxide; the discovery in the ore of platinum of two new metals, palladium (1804) and rhodium (1806); and the determination (1809) of the identity of the supposed new metal tantalum with columbium. He also established the important doctrine of multiple combinations of chemical substances in a paper "On Super-acid and Sub-acid Salts," which was printed in the "Philosophical Transactions" for 1808; and by suggesting the construction of a synoptical scale of chemical equivalents, did much to establish in Britain the theory of definite proportions. By his ingenious discovery of a mode for making platinum malleable, he is said to have gained £80,000, and his mode of hardening steel, and some other discoveries of a practically useful nature, were also very lucrative. His contributions to optics were the celebrated "Goniometer" (q. v.), a most valuable gift to mineralogists; an apparatus for ascertaining the refractive power of solid bodies; the "Camera Lucida" (q. v.); the discovery of invisible rays outside the violet band of the spectrum; and an immensely of valuable and interesting observations on single and double refraction. To other sciences his contributions were also of importance, for he was the first to demonstrate the identity of galvanism and common electricity, and explain the cause of the difference in the phenomena exhibited by each; he invented a "cryophorus" for illustrating the theory of heat; constructed a most convenient kind of blowpipe, &c. W. was elected secretary of the Royal Society, November 30, 1806; and on November 30, 1823, he was awarded one of the Royal Medals for his discovery of the mode of making platinum malleable. He died of effusion of blood on the brain on December 22 of the same year. His most important Memoirs, 83 in number, will be found in the "Philosophical Transactions" (1800-1829).

WOLSEY, Thomas, Cardinal, was born in 1471 at Ipswich, in the county of Suff-

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folk, and is reputed to have been the son of a butcher of that place. Though thus of humble origin, it is certain that by some means a good education was secured him, and, at an unusually early age, he was sent to Magdalen College, Oxford, of which he became a Fellow. It is said that while at Oxford, he was brought into somewhat intimate relations with the great Erasmus, unquestionably then in England. He afterward acted as tutor to the sons of the Marquis of Dorset, through whose favor he became in 1500, rector of Lymington, in Somersetshire. On one occasion he appears to have got himself into difficulties. At a fair in the neighborhood, it was his misfortune one day, it is said, to be found drunk and disorderly; and by a certain knight of the shire, by name Sir Amias Poulet, he was put in the stocks for the indemeanor. That he figured in the stocks is certain; that he did so on the score of drunkenness there is no adequate evidence. When the power to retaliate came to him, he took his revenge on Sir Amias by having him imprisoned for six years.

W., who was plainly one of the most insinuating of men, in Somersetshire became intimate with a Sir John Nafant, a man of considerable mark. Through the influence at court of this gentleman, he was appointed chaplain to Henry VII., with whom he speedily ingratiated himself. Being sent by the king on a special embassy to the continent, he acquitted himself so dexterously, that he rose still higher in favor; and in 1508, the deanery of Lincoln was conferred on him. The year after, Henry VIII. succeeded to the throne left vacant by the death of his father. Nearly from this time forward, the life of W., previously noted, indeed, as a rising man, yet of no special public importance, is in effect the history of the England of which he implicitly became the ruler. From Henry he enjoyed the most unbounded favor and confidence; and the influence which he thus exerted in the conduct of affairs was such as has seldom been exerted by a subject. The most valuable ecclesiastical preferments were showered upon him; and finally, in the same year (1515), he obtained the bishopric of Lincoln, and the archbishopric of York. The year following, the dignity of cardinal was conferred on him by the pope, who, not long after, appointed him also legate. Besides these ecclesiastical honors, he was made by the king, in 1518, his Prime Minister, and Lord High Chancellor of England. From this time, up to that of his forfeiture of the royal favor, W. was one of the most important men in Europe; and at home his power was almost without limit. The revenues derived from his various offices were of princely magnitude; and they were further enlarged by subsidies from foreign potentates, eager to conciliate his favor. He did not bear his honors meekly; in his way of life he affected a sumptuous magnificence, and a state only not royal, whilst in bearing he was arrogant and imperious. He openly aspired to be pope; and there seemed more than once ground for supposing that this crowning object of his ambition was really within his reach. He was, however, disappointed; and it has been surmised that his resentment against Charles V., to whom he attributed his failure, determined, to a considerable extent, the foreign policy of the country.

Such a man could not fail to have many enemies, eager, as occasion might offer, to discredit him with his royal master; and an occasion at length came, of which they did not fail to take advantage. To the project on which the king had set his heart, of divorcing Queen Catharine, and marrying Anne Boleyn, W. shewed himself hostile; of the latter part of the scheme he was known to disapprove; and his negotiations with a view to securing the consent of the pope to the divorce were conducted, as it seemed to the king, in a dilatory and half-hearted manner. Henry, where his passions were interested, could little brook contumacy of this kind; his displeasure was carefully fanned, and the disgrace of W. was accomplished. In 1529, he was stripped of all his honors, and driven with ignominy from the court. Symptoms of relenting shewed themselves, however, next year in the mind of the monarch, and it seemed as if W. might again be taken into favor. The prospect, as it proved, was delusive. Being at the time in Yorkshire, the archbishopric having been restored to him, along with others of his minor preferments, he was arrested on a charge of high treason, and ordered to be conveyed to London for trial. On his journey, he was attacked with dysentery, and at the monastery of Leicester, in November 1530, he died.

The faults of W.'s character are obvious; but if his pride, ambition, and rapacity

were inordinate. his luxury and ostentation somewhat unbecoming a successor of the primitive apostles, he was not without redeeming qualities. Haughty and insolent to his enemies, and those whose claims ran counter to his own, to his dependants and inferiors he was generous, affable, and humane; and not a few of them shewed their honorable sense of this by devotion to him in his misfortunes. Of learning, he was a most liberal and enlightened patron; and the endowment of Christ Church College, Oxford, survives as a monument to attest this. He was plainly a man of large and splendid capacity; and he seems, on the whole, to have been a diligent, faithful, conscientious, and salutary counselor and servant of the monarch who so long and entirely trusted to him.

WOLUSPA—I. e., the prophecy of Wala—is the name of an old Norse poem preserved in the older Edda, which principally contains the description of the creation and the destruction of the world. The Wala who delivers the utterances, whose name properly signifies *prophetess*, appears in it herself as a mythical being. According to Weinhold's explanation in Haupt's "Zeitschrift" (1847), the poem, as we have it now, was produced out of older popular songs by the hand of a later author at a time when Christianity had already penetrated into the north, somewhere in the first half of the 9th century. Besides being contained in the Edda, it has been separately published by Gräter (Leip. 1818), by Ettmüller (Leip. 1830), likewise by Bergmann in the "Poesies Islandais" (Par. 1838), and by Dietrich in the old Norse "Lesebuch" (Leip. 1843).

WOLVERHAMPTON, a municipal and parliamentary borough of Staffordshire, a flourishing centre of the manufacture of iron, iron wares, and tin-plate goods, and the most populous and wealthy town of its county, 10 miles north-west of Birmingham, with which it is connected by railway. Besides Roman Catholic and other Nonconformist chapels, numbering in all 25, there are also within the municipal borough 10 churches, of which that of St Peter's is a stately edifice with a lofty embattled and pinnacled tower. In the immediate suburbs there are (1867) 3 new churches and 4 Nonconformist chapels. Of these 18 churches and 29 chapels, 11 churches and two-thirds of the chapels have been erected since 1837. Its leading public schools are—a thriving grammar school founded 1714; an Orphan Asylum, instituted 1860, for orphans from all parts of the kingdom, with 100 scholars, and room for 20; and a School of Practical Art, opened 1854. Among its philanthropic institutions a General Hospital and Dispensary, opened 1849, having 100 beds, and, like the Orphan Asylum, supported by voluntary contributions, is the chief. W. sent members to parliament first in 1832, and became a municipal borough in 187. It has Quarter Sessions of its own, a spacious cattle market, and a market hall. A commodious and handsome town-hall has been erected; there is a system of deep sewerage; and its abundant water supply is in the hands of the corporation. There is a handsome bronze equestrian statue of Prince Albert standing in Queen Square. The town possesses an Exchange, where iron-masters and merchants assemble; and an Agricultural Hall, for the use of farmers and corn dealers. W. stands upon the western edge of the extensive coal and iron mining district of South Staffordshire, and is the metropolis of that district. On the south and east, the vicinity is covered with coal mines, iron-stone pits, blast furnaces, forges, rolling mills, and foundries; but on the north and west it is rural and picturesque. Its chief manufactures are tin-plate and japanned goods (14 manufactories), enamelled hollow wares, locks and keys, edge-tools, iron braziers and galvanised iron goods, gas and water tubes, cables and railway fastenings, iron-foundry goods, machinery, mills, cut nails, tips, cast hinges, electro-plate and papier-mâché goods, brass castings, and finished iron. Besides the establishments engaged in the hardware manufacture, there are several flour-mills and chemical and artificial manure works. The hardware goods manufactured at W. are remarkable for beauty of finish and genuineness of workmanship. The town enjoys unusual facilities for communication and transport. For a considerable time, it has commanded canal communications; and more recently, it has become the focus of a number of converging lines of railway by means of which it is placed in direct relations with the important quarters of the country. Its market-day is Wednesday, under a charter by Henry III. (1258). The borough returns two

members to the House of Commons. Pop. (1861) of parliamentary borough, 147,670; (1871) 156,978. Pop. (1861) of municipal borough, 80,860; (1871) 64,291.

W., a town of considerable antiquity, was originally called Hampton, and afterwards Wulfrune's Hampton (of which its present name is a corruption), from the circumstance that Wulfrune, the sister of King Edgar, founded here (996), the church and college of which St Peters is the modern representative.

WOLVERINE. See GLUTTON.

WOMEN'S RIGHTS. In 1851, an article in "The Westminster Review" attracted attention to the novel subject of the enfranchisement of women. Since that time, the agitation for women's rights has in this country, and to a still greater extent in America, attained the dimensions of a political movement. The subject has therefore become one of general interest. The following is an account of the claims included in women's rights, and a brief statement of the chief arguments by which those claims are supported.

1. *The Political Rights of Women.*—The discussion has hitherto turned upon the right to the suffrage. The right to vote is claimed in accordance with the principles of political reasoning that are held conclusive in the case of men. The argument applies with peculiar force to a democratic constitution. Democracy involves two ideas. It is a protest against privilege and against despotism; it maintains that every individual is born with an equal right to the protection and consideration of the law; and it affirms that every one must have a vote in order to secure this fundamental right. The practice of the United States shows a gradual approach to those principles. Till lately, the negroes were refused the benefit of them; but the privilege founded on color has perished, and there remains now only the privilege founded on sex.

In England, the right to vote has been made to rest on the principles of English law. A petition of women to the House of Commons, presented on the 7th of June 1866, set forth, that the possession of property in this country carries with it the right to vote in the election of representatives in parliament. From the earliest times, the principle of the English constitution, and the spirit of the English people, have required that no man's property should be taken for the purposes of government without his consent. Since, therefore, the English law permits women to hold and manage property, it seems anomalous and inconsistent that it should refuse them a vote to protect their property from inordinate taxation. Other persons allowed by the law to hold property, but excluded from the suffrage, are minors, idiots, lunatics, and criminals. But the principle of disqualification in those cases does not apply to women. Moreover, there is alleged to be historical evidence that women have voted both in counties and boroughs. The disuse of the privilege is traced to historical causes. Such was the violence of the time, that women were often unable to administer their property, and it was therefore natural that they should take little part in elections. Besides, the right to vote was at first regarded, not as a privilege, but as a burden; for the power of the Commons was low, and the expense of paying members of parliament was considerable. The disfranchisement of women is therefore held to be an anomaly in the constitution, as it was an accident in history.

The objections to female suffrage are various. In an argument in the "Times," it is said: "There exists, as it were a tacit concordat guaranteeing to the weaker sex the protection and deference of the stronger, upon one condition only: that condition is the political dependence of women." This asserts a claim on the part of men to make laws for women, in return for protection and deference. Now, protection to person and property every one has a right to who obeys the laws and contributes to the support of the government. The reason for refusing votes to women must lie deeper. It may be said that, inasmuch as women are weak and at the mercy of men, men abstain from abusing their superiority only on one condition; that condition is, that women shall have no legal rights except those that men are pleased to give them. In the last resort, the rights and privileges of any class of men depend on their might. The nobility established their privileges when they had power. The working-class has been admitted to the franchise because its power has increased. But women have no physical power to enforce their rights. If rights are to be measured by might, women will occupy the bottom of the scale.

This is their position among savages. But, as civilisation has advanced, men have learned to renounce the advantage of their physical superiority, and freely to give women privileges that could not have been extorted. It would therefore seem that the rights women actually enjoy do not depend upon, and are not to be measured by, their physical strength. The rights of women flow from the prevailing sense of justice, and justice now means that the interests of women be consulted with as much impartiality as the interests of men. An unjust preference of either would be mischievous to both. Since, then, the interests of women should be fairly considered, what reason can there be to prevent them voting, and thereby intimating what views they take of their own interests?

Another objection to the enfranchisement of women is, that women have no business with politics, and that politics would withdraw them from their proper duties. Is this apprehension well founded? Granting that domestic life is the proper sphere of women, is it really impossible to unite an interest in politics with attention to a family? Upon this subject, we are not altogether without experience. In the great dissenting churches in Scotland, women, though excluded from office, vote equally with men in the appointment of ruling-elders, ministers, and in everything that is decided by a popular vote. But this privilege has not "hardened" them, or made them "unfeminine," or interfered with their household work. On the other hand, it has largely contributed to the success of the voluntary system, and to the strength of the church. The chimerical nature of the alarm felt on this subject has been illustrated by the objections that might be made against allowing clergymen to vote. "We should be told that clergymen have no business with politics; that it was their province to attend to spiritual matters, and that they ought to confine themselves to their proper sphere; that if they were permitted to participate in political affairs, it would deteriorate from the sanctity of their character; that the passions aroused by political contests were inconsistent with that spirit of meekness and holiness which we look for in preachers of the gospel." Women are not wholly excluded from politics. In some countries, a woman may be sovereign; and history records many examples of women that have had the highest capacity for government. Women in this country, if they have the same qualification as men, have parochial votes. And few would go so far as to propose that women should not only be shut out from public affairs, but also be kept ignorant of politics. Even if family-life be made their sole occupation, it surely is not to bound the horizon of their knowledge and sympathies.

The remaining objections may be taken together. They are of the same kind as those recently employed against the enfranchisement of the working-class. They are briefly: That the interests of women are not neglected, for they are represented by their male connections; that women are ignorant of politics; that they would be exposed to intimidation at home, and to violence at the polling-booths; and lastly, that women do not want votes. It is not allowed that women are sufficiently represented by their male connections. Such indirect influence is not considered, in other cases, to be a reason for withholding the suffrage. Rich men have a great indirect influence, but they have also votes. It is an old argument, that operatives were represented by their employers; but that argument never convinced the operatives, and it has now ceased to affect the legislature. Why, then, should a vicarious representation, which is repudiated by every class of men, be considered sufficient for women? On the contrary, if women had votes, their interests would be better attended to, because no member can disregard with impunity any important section of his constituents. It would be the policy of statesmen to devise and carry out measures for their benefit.

But, it is said, women are ignorant of politics. This objection has lost much of its weight, now that household suffrage has been established. Educated women are surely not behind many of the new voters in political knowledge. Still, women, in general, know less of politics than men. They are constantly told that politics form no part of their business, and their opinions, like those of non-electors, have little direct and palpable influence on affairs. Political knowledge generally follows political power. Women have not the stimulus that acts on men; they have not the knowledge that their opinions form part of the legislative power.

There is little reason to fear that the possession of a vote would expose women to coercion and improper influence. The law has already defined a more serious

danger. It permits women, and by special arrangement, even married women, to hold property, and it trusts its ability to protect them from the importunities of relations. If women can defend their property from greedy relatives, they will be no less able to give independent votes. The objection that women would be exposed to violence at the polling-booths, is not formidable. If such were the fact, it would be no argument against female suffrage; it would be an argument against polling-booths. Should the police, however, be unable to protect female voters, there is the easy resource of voting-papers, already in use in the elections in the English universities.

The last objection is, that women do not want votes. A large number petitioned the Commons in favor of extending the franchise to women that possessed a household qualification; these petitioners represent a very much larger number, who are kept back by the various social checks that prevent women taking part in political agitation. Nor can there be any doubt that a proposal that makes way with men simply on the ground of justice, will find still more favor with women, since their interest is ranged on the same side.

The claim of women to the suffrage is not without support from practical considerations. History teaches that women must have votes in order to protect their interests; men, through all the vicissitudes of history have shewn a constant preference of their own interests. In the words of Lord Macaulay: "If there be a word of truth in history, women have been always, and still are, over the greater part of the globe, humble companions, playthings, captives, menials, beasts of burden. Except in a few happy and highly civilised communities, they are strictly in a state of personal slavery. Even in those countries where they are best treated, the laws are generally unfavorable to them, with respect to almost all the points in which they are the most deeply interested."

In this country, women suffer from serious grievances. They are excluded from the universities, and no provision is made to give them the high education that men value. In consequence of this men enjoy almost a monopoly of educated labor. Most of the charitable endowments for education in England were destined by the founders for girls as well as boys; but they have been generally appropriated to boys. Christchurch Hospital was intended for boys and girls; it educates 1100 boys and 26 girls. Women also are excluded from the professions and the higher branches of industry. The situation of a governess is almost the only one open to educated women; from other occupations they are shut out, partly by rules, partly by neglected education.

The law is unfair to women, especially the law of marriage. Marriage is constituted by free consent, and is supposed to imply the approval of both parties. Now, it would be a hard bargain, where one of the parties was offered all the terms of it in a lump, and was therefore obliged to take everything or reject the whole; yet all the incidents of marriage, all the terms of the contract, are fixed by the law; and the law is made by men. In constituting the relation of marriage—a relation of even greater importance to women than to men—women have no voice, they have only a barren and impracticable veto. The result is familiar to every lawyer. By the law of England, the custody of a woman's children, after seven years of age, belongs exclusively to her husband; after they reach that age, she has no right even to see them. The common law strips a woman of her property, and leaves her fortune at the mercy of her husband; the husband also can seize his wife's earnings, unless she is protected by a judicial separation, or by an order from a magistrate. A married woman cannot enter into contracts. In practice, this bad law is avoided by settlements made before marriage; but this protection involves expense, and is in a great measure confined to the rich. More recent legislation is as unfair as the older law. In 1857, the Divorce Court was established, and it was enacted that, for adultery on the part of a wife, the husband could obtain a divorce; but for the adultery of a husband, a wife was not allowed a divorce. In addition to adultery, the husband must be guilty of cruelty or desertion. This inequality goes to the root of the marriage-contract: it means that, in consideration of maintenance, a woman gives her person to her husband, and therefore, unless she is ill-used or abandoned, she gets in substance what she bargained for. The law is severe on offences against property; it is comparatively lenient in punishing brutal assaults by husbands on wives; garroters are flogged, but not wife-beaters. Finally, in the words of Lord

Brougham: "There must be a total reconstruction of the law, before women can have justice."

2. *The Industrial Rights of Women.*—These embrace admissibility to all offices, occupations, and professions; also admission to the universities, or some adequate provision for the education of women so as to fit them for high posts. This raises the question of the proper sphere of women. The prevailing ideas point to marriage as the true, if not the sole end of a woman's existence; but this theory is inadequate to meet our social difficulties. Many women are unmarried. What is to be done with them? To hinder them from doing the best they can for themselves, would be a manifest injustice; therefore, in the interests of single women, all occupations should be open. But the claims on behalf of women do not stop there. It is denied that men have any right to exclude women from active life, and to drive them into marriage as their only livelihood. On grounds of justice, the right of women to enter into industry is conceived as almost too clear for argument.

The objections to the Industrial Rights of Women must be noticed briefly. It is said that the proper sphere of woman is domestic life, and that she is by nature unfit for the struggles of industry. It appears from the census that just one half of women above twenty years of age are confined to domestic life. About a third of the adult female population are either of independent means, or support themselves by non-domestic industry; the rest occupy a secondary position in the industrial world, by assisting their husbands in business. But though the number of women engaged in industry is great, they are confined to poorly paid occupations, and their labor is for the most part unskilled. Generally speaking, the women of the middle class take no part in industry. The real issue is therefore narrow. It is not, shall women be admitted to industry? for that is settled; but, shall skilled and educated female labor be allowed? There is no evidence that women have no capacity but for the meanest employments. What they are fit for, can be finally determined only by actual trial. All that the advocates of women's rights ask is, do not anticipate the result, or foreclose the experiment. Some think that while it is desirable women should not be left unoccupied, they should not be admitted to industrial occupations, but society should seek a field for unmarried women in some works of charity or religion, or in some semi-domestic pursuit. This proposal is an attempt to establish, in this country, that provision for unmarried women that is supplied by the monastic system in Roman Catholic countries. The objection to it is clear. If this semi-domestic pursuit is the most agreeable and lucrative to women, they will, of course, hail the discovery of it with gladness; but if it is not, they may decidedly object to make martyrs of themselves.

A common objection is, that to take women from domestic work would harden them, and destroy the peculiar traits of their character. Now, a great part of what used to be the work of the household has passed to another province; spinning, weaving, brewing, and baking were at one time domestic work. If women are to do their ancient customary work, they must follow it abroad. Those who believe that the peculiar attributes of women are an artificial product of civilisation, may feel alarmed at any disturbance of the present condition. But the genuine distinctions between the sexes flow from organisation, and will not be obliterated by similarity of education and employment; on the contrary, no feminine charm would be lost, but women would be more spirited, more intelligent, and finer companions for men.

It is an argument sometimes relied upon, that an admission of women to industry would be prejudicial to men, because it would increase the supply of labor, and thereby lower the rate of wages. This objection is founded on the principle, that, when the wage-fund is constant, the rate of wages falls as the laborers are more numerous, and rises as they become less numerous. But the competition of women is, to some extent, an exception, for if they do not work for themselves, they must be supported out of the wages of men. If, however, wages were to fall below the ordinary standard of comfort, the tendency would be, by fewer births or emigration, to reduce the excess of laborers, till the supply of labor should be adjusted to the required standard of wages; and experience shows that wages are not permanently

lowered by the admission of women to industry. In the working class, wages adjust themselves to a scale enabling a working-man to maintain a wife and family.

In the last place, it is said that active life is inconsistent with the cares of maternity. This, of course, has no application to the large class of childless women; and there can be no necessity for prohibiting women from entering into industrial life, if their situation renders it impracticable. The incompatibility between active life and maternity may safely be left to look after itself. From the returns in the census, it appears that one out of eight married women are employed in non-domestic labor; but, since many of their occupations are not incompatible with household duties, and since many have no children to attend to, it seems probable that only among a small number of the working-class, the duties of maternity are sacrificed to out-door employment. It is, however, a moot-point how far maternity interposes a barrier to the industrial education and employment of women. In the working class, the mother usually nurses her children, for she could seldom make a profit by engaging in another employment, and hiring a servant; but if women were employed in skilled and well-paid occupations, they would probably leave nursing, which at present is unskilled labor, to servants. The solution of the problem must, however, be left to trial and experience. One principle, at any rate, is clear: except in so far as women are occupied as mothers, they should be employed in the most remunerative work. That would be beneficial to men, for it would relieve them of a pecuniary burden; it would be beneficial to women, for it would make them independent.

The women of the middle class, led astray by a mistaken aspiration to aristocratic leisure, have held aloof from the struggles and rewards of industry. This operates injuriously in various ways. It creates an unnatural competition with working-women, as in needle-work. Middle-class women often discharge duties that might well be left to upper servants. If they entered into commerce and trade, they would fit themselves for, and require, a higher kind of occupation than those thankfully accepted by poor and untalented women. At present, the higher walks of business, and even subordinate offices of trust and skill, are monopolised by men; hence women engaged in the lower employments derive little pecuniary benefit from trustworthiness, experience, or judgment, and have no hope of rising. If they should attempt to better their condition, they are left without encouragement or support. The exclusion of women of the middle class from industry is hurtful to themselves. It often leads to poverty of the bitterest kind—the poverty of gentlewomen. It leaves them without occupation, a prey to ennui and bad health. It also forbids perfect companionship and sympathy between the sexes. The whole scope of a man's education is towards industry. In it he lives, and moves, and has his being. But of this world, women have no direct knowledge. Hence a want of intellectual sympathy between men and women, and an absence of any common standard of reasoning and evidence. Nor is this all. The virtues upon which industrial and public life repose, do not derive due support from women. They are ignorant of the difficulties that beset moral problems under circumstances of which they have no experience, and their moral wisdom can hardly go beyond traditional saws. Indeed, their influence is sometimes on the wrong side. A man will be reluctant to injure his family in their pecuniary interests, for some point of conscience that his wife does not sympathise with, or for objects that she does not understand.

No account of women's rights would be complete without some notice of the claim to equality in marriage. This is the goal to which history points. "Among tribes which are still in a primitive condition, women were and are the slaves of men for purposes of toil. All the hard bodily labor devolves on them. In a state somewhat more advanced, as in Asia, women were and are the slaves of men for purposes of sensuality. In Europe, there early succeeded a third and milder dominion, secured, not by blows, nor by locks and bars, but by sedulous incantation on the mind; feelings also of kindness, and ideas of duty, such as a superior owes to inferiors under his protection, became more and more involved in the relation. But it did not for many ages become a relation of companionship, even between unequals." That stage has now been attained, and, "for the first time in the world, men and women are really companions." Women cannot be good companions for men unless they are equals. If they are kept inferior in education and knowledge, their influence will tend to drag men down to their own level. The intercourse, moreover, that is of value is not intercourse between an active and a passive mind,

but between two active minds. The theory of the subordination of women involves several bad consequences; for women being unable to attain their ends directly, have recourse to management and artifice.

The general movement of society is from subordination to equality. Under the feudal system, society was constituted on the principle of subordination. The land was tilled by serfs, and there were few but said that serfdom was the natural position of a creature so low as an agricultural laborer. But serfdom did not endure, and we have learned that it is happier for an parties that the land should be tilled by freemen. And now, too, negro slavery, the most plausible form of slavery, has been abolished. The tendency of social changes is towards equality, as the most satisfactory relation between man and man; it also seems to point to equality as the highest relation between man and woman.

In the year 1869 an important step was taken towards the recognition of the claim for the concession of political franchises to women. In a bill passed in parliament respecting municipal elections, a clause was inserted extending the right of voting at such elections to women. Similarly, by the English and Scotch Education Acts of 1870 and 1872, women are permitted to vote at the elections of school boards.—The subject of women's rights is discussed in the following: "Disfranchisement and Disfranchisement," by J. S. Mill, vol. ii., "Enfranchisement of Women;" "The Political and Social Dependence of Women," 1867; "The Industrial and Social Position of Women," 1867; Speech by J. S. Mill in House of Commons, May 21, 1867; "The Westminster Review," Jan. 1867; Professor Cairnes in "Macmillan's Magazine," Sept. 1874.

WOMB, The, professionally known as the *Uterus*, is a flattened, pear-shaped organ. It consists of a body, a base or fundus, a neck or cervix, and a mouth or *os uteri*. It lies in the line of the axis of the outlet of the Pelvis (q. v.), with base directed upwards and forwards, and the neck directed slightly backwards. In the unimpregnated condition, which we are now considering, it is about three inches in length, two in breadth, and one in thickness, and weighs about an ounce and a half. On laying it open, or exploring its interior by the introduction of an instrument through the *os uteri*, its cavity is found to be very narrow, and to contain a little mucus. Its walls are nearly half an inch thick, and are mainly composed of muscle-cells and fibres running irregularly in all directions except round the *os*, where they make a partial sphincter. This muscular coat, which constitutes the bulk of the organ, is covered externally with a serous coat, derived from the peritoneum, and is lined internally by a mucous coat continuous with that of the canal called the *vagina*, by which the interior of the womb communicates with the outer surface of the body. This mucous coat abounds in small mucous follicles, and is provided with ciliated Epithelium (q. v.). The neck or *cervix* is distinguished from the body by a well-marked constriction. The mouth, or *os*, projects slightly into the *vagina*. This opening is nearly round in the virgin, and transverse after parturition. It is of considerable size, and is named the *orificium uteri externum*; it leads into a narrow canal which terminates at the upper end of the *cervix* in a smaller opening, the *orificium internum*, beyond which is the shallow triangular cavity of the womb, of which it forms the lower angle, while the two upper angles, which are funnel-shaped, constitute the beginning of the Fallopian Tubes (q. v.), whose apertures are so small as only to admit the passage of a fine bristle. The blood-vessels and nerves enlarge in a very remarkable way during pregnancy, so as to adapt themselves to the increased wants of the organ, which, at the fifth month of utero-gestation, weighs from two to four pounds. The term *appendages to the uterus* is given to the Fallopian Tubes and Ovaries (q. v.), which are enclosed by the lateral folds of the peritoneum called the broad ligaments. The womb is suspended in the pelvic cavity in such a way as by its mobility to escape rude shocks from without or disturbances from the varying conditions of the surrounding viscera, while at the same time to allow of its vastly increasing in bulk with comparatively little discomfort when pregnancy occurs. This is effected by several duplicatures of peritoneum, containing variable quantities of fibrous and muscular tissue, and known from their form or connection as the *broad*, the *round*, the *utero-sacral*, and the *utero-vesical* ligaments.

The uterus is an organ peculiar to the Mammalia, and in comparatively few of them (excepting the Apes and Cheloptera) is it of the simple oval or triangular form which we have described. It is *two-horned* in the Ruminantia, Pachydermata,

Sollipedia, and Cetacea; and it is said to be *divided* where it has only a very short body, as in most of the Carnivora and Edentata, and some Rodentia, which speedily divides both externally and internally, and is continuous with the oviducts or Fallopian tubes. The uterus is actually *double* in some of the Edentata, and in most of the Rodentia, including the mouse and hare; in which each Fallopian tube passes into an intestiniform uterus, which has two completely distinct openings lying near to each other within the vagina. In the Marsupialia and Monotremata, the modifications of this organ are still more singular.

It is impossible to do more than name the chief offices or functions of the womb. They may be divided into those which relate to (1) Menstruation (q. v.), (2) Insemination, (3) Gestation, and (4) Parturition.—For a complete account of the anatomy, physiology, and pathology of the uterus and its appendages, we must refer to a masterly article by Dr Arthur Farre on that subject in the last volume of the "Cyclopædia of Anatomy and Physiology."

WOMB, Diseases and Derangement of the. In this article we shall not include the ailments of the pregnant or of the puerperal state, some of which as *Phlegmasia Dolens* and *Puerperal Fever*, have been noticed in special articles. Many of the diseases, however, which we shall have occasion to notice may be traced to pregnancy, miscarriage, or severe delivery, that had occurred months previously. A common result of inflammation that often succeeds miscarriage or a bad delivery is to check that process of involution by which the wound ought to be restored in a few weeks to the size and condition in which it existed previous to the occurrence of pregnancy. For a lucid description of the processes which act on the enlarged womb to restore it to its original state, we must refer to Dr West "On Diseases of Women," 2d ed. p. 90. How inflammation acts in interrupting these processes, is not easily explained; but after it has passed away, its effects may remain in the enlarged size and altered structure of the womb, changes which render it likely to suffer from the alternation of activity and repose to which the female generative system is liable. In this condition, the enlarged and heavy uterus is very likely to become prolapscd, or to become a seat of permanent congestion or chronic inflammation; and excessive menstruation and a feeling of weight in the pelvis are almost always present. Besides this form of enlargement, there is a far less common form in which the enlargement of the womb takes place independently of previous pregnancy, and is the result of true hypertrophy. The symptoms are, according to West, "a sense of weight in the pelvis, pain usually of a burning character, hæmorrhages having gradually come on, and forced themselves by their slowly increasing severity on the patient's notice." The treatment is much the same in both these forms of enlargement—viz., the recumbent position on a hair or spring mattress, attention to the bowels, and local leeching every fortnight, to be continued for several months, together with the careful use of iron associated with small doses of iodide of potassium. Temporary separation from the husband's bed should also be insisted on. There is also a form of hypertrophy which is confined to the neck of the womb, which occasions great discomfort to the patient, and acts as a mechanical impediment to sexual union. In these cases, no relief can be afforded except by a surgical operation, which is described in West, *op. cit.* p. 77.

From these results of "simple errors of nutrition," leading to increased growth of the organ, we pass on to the debatable and much-trodden ground of *inflammation of the womb*. *Acute inflammation* of the unimpregnated womb may arise from unaccustomed and excessive sexual intercourse, sudden suppression of the menstrual discharge, the extension of gonorrhœal inflammation, &c.; but, as it is comparatively rare, and seldom dangerous to life, we shall at once pass on to an affection which by most practitioners is regarded as one of the commonest to which women is liable—viz., *chronic inflammation and ulceration of the neck of the womb*. It is not forty years ago since a French physician, M. Recamier, invented an instrument—the speculum—for the application of local remedies to the neck of the womb in cancer; but the light which this instrument threw upon uterine conditions generally, led, amongst other results, to the conclusion, that leucorrhœal discharges (popularly known as *the whites*) were often derived from, and associated with, various morbid appearances of the mouth of the womb, and could often be removed by remedies directed to that part. Almost ever since the speculum began to get into general use, a large number of old-fashioned practitioners raised up a cry against its employment, on the grounds

of its indelicacy, its inutilty, &c., and denied the very existence of various morbid conditions, which the employers of the instrument declared they saw with its use. Hence two parties have arisen—one who believe in the speculum and its revelations; and another who reject the recent modes of investigating uterine diseases, who take small account of the new facts regarding local disease which have been revealed, and who regard uterine ailments as resulting from constitutional derangements, and who therefore trust mainly to general treatment. Now, although the view that the local disease is everything, may not be universally true, the opposite view is certainly untenable; and Dr West and other writers on this subject have pointed out that there are reasons why the womb should more frequently than perhaps any other organ be the seat of certain forms of local ailment, and should consequently require the frequent employment of local treatment. It would be out of place in these pages to describe the characters of the ulcerations or abrasions of the mouth of the womb, which are so frequently revealed by the speculum, or to enter into any detail regarding the high pathological importance attached by some writers to them. The conclusion which Dr West draws from a prolonged investigation of this subject is, that "the condition of so-called ulceration or abrasion of the os uteri is far from infrequent, even in cases where no uterine symptoms were complained of during life; but that it is usually unassociated with other important affections of the uterus, such as may be supposed to be the effects of inflammatory action; and, further, that such affections do not seem to be readily excited by causes acting on the neck of the womb, either when displaced, or when the organ is in its natural position."—*Op. cit.*, p. 120. Since uterine pain, disordered menstruation, and leucorrhœal discharges—the symptoms usually associated with ulceration of the mouth of the womb—are met with by impartial observers almost as frequently *without* as *with* ulceration, it may be fairly inferred that this ulceration is neither a general cause of uterine disease, nor a safe index of its progress; and although the local application of caustic to the os uteri is doubtless often successful in restoring the patient to health, it must not be considered as a general rule that the attempt, by local remedies, to remove this condition is the one and all important point in the treatment of uterine disease. There is no doubt that, in the great majority of these cases (excepting a few of the more severe ones), temporary separation from the husband's bed, the recumbent position (which facilitates the return of blood from the womb and adjacent parts), due attention to the diet and state of the digestive organs, and the use of injections of nitrate of silver, which may be applied by the patient, are sufficient in a few weeks to effect a cure. Chronic uterine inflammation of a more general nature (as of the interior, or body of the womb), with very similar symptoms, is by no means rare. If the disease is met with in the acute form, leeches should be applied to the womb itself; in the chronic form, which is generally observed, the pain in the back is best relieved by a croton-oil liniment, composed, according to Dr West's directions, of one part of croton oil to ten of the camphor liniment (of the London Pharmacopœia), which should be applied (without rubbing it in) with a sponge twice a day on the back, at the seat of pain. Belladonna plaster or liniment also gives temporary relief. The irritability of the bladder, which is a common symptom, is usually associated with abundant phosphatic deposits in the urine, and is best relieved by a combination of ten or fifteen minims of dilute hydrochloric acid, half a drachm of tincture of henbane, and two ounces or more of decoction of Pareira-Brava (see Cissampelos), three times a day; and the tepid hip-bath may be used with benefit. The same general rules as to rest, diet, &c. which have been already given, must be attended to. Under the best management, a tendency to relapse is liable to occur at each monthly period, and after several such relapses, the womb is found (on surgical examination) to be enlarged and hardened, and less movable than natural. This condition is best removed by the careful and prolonged use of bichloride of mercury in small doses, which, as it is a deadly poison, must only be taken by professional advice; but the pain in the groin which usually accompanies this change, may be relieved or removed by the application of a small blister. The profuse discharge—both menstrual and leucorrhœal—is best relieved by chalybeate preparations, of which the following is a useful and favorite compound: Take of sulphate of iron, 6 grains; sulphate of magnesia (Epsom salts), 8 drachms; dilute sulphuric acid, half a drachm; syrup of orange peel, half an ounce; caraway water, sufficient to make a mixture of 6 ounces of which one ounce may be

taken thrice daily, after meals; or if there be much hæmorrhage, a mixture of alum and sulphate of iron (4 grains of the former to 1 of the latter, dissolved in a small tumbler of water) may be taken three times a day. A hip-bath, containing half a pound of alum to every gallon of water, is often very useful as an astringent. It should be taken in the morning before dressing, and the patient should remain in it at least a quarter of an hour. For the first time or two, the water may have the chill just taken off. The same importance is not at present attached to vaginal injections as when it was believed that the vagina (and not the womb) was the main source of leucorrhœal discharge. In a case of leucorrhœal discharge of long standing, an excellent astringent injection may be formed by dissolving two drachms of tannin and half an ounce of alum in a quart of water. Special forms of female or vaginal syringes are sold for this purpose. Of the application of caustics to the mouth of the womb, we say nothing, as that is a matter which must be left solely to the medical attendant.

From these remarks on the diseases of this important organ, we pass on to a very brief notice of its occasional *misplacements*. The singular mobility of the womb (without which pregnancy would be almost an impossibility) exposes it to the risk of displacement to such a degree as often to give rise to great personal discomfort. As all the causes which tend to produce displacement (such as increased weight of the organ during pregnancy, pressure of the superincumbent viscera, &c.) act in a downward direction, the obvious tendency of the womb is to be thrown downwards, or to suffer *Prolapsus* (q. v.), an affection which, in its extreme degree, when the organ is more or less protruded externally, is termed *Procidentia*. Causes sometimes come into play which incline the upper part of the uterus either backward or forward, giving rise to *retroversion* and *anteversion*, instead of mere prolapse. Prolapsus is sufficiently considered in the article bearing that title; and for a more detailed description of the symptoms and treatment of the two last-named misplacements, we must refer our readers to the standard works on the Diseases of Women.

The tendency of the womb to hypertrophy has been noticed at the beginning of this article; its individual tissues have a similar tendency to overgrowth, shewing itself at particular parts, and thus giving rise to tumors or outgrowths, which are more common in this than in any other organ. Under this head may be mentioned several varieties of *Polyptus*, which differ essentially in structure, but all of which are invested by the mucous membrane which lines the uterus, and are liable to be the source of hæmorrhage. Their removal by surgical means is generally a matter of no difficulty. Much more important than these is the *Fibrous Tumor* which is frequent in its occurrence, serious in its effects, and very slightly amenable to treatment. These tumors are of a spherical form and firm texture, resembling that of the womb itself, and usually occur in groups; several being frequently present, while one or two are considerably larger than the others. The symptoms to which they give rise vary extremely according as the chief tumor lies on the outer part of the womb, and grows into the abdominal cavity, or is developed within the walls of the womb, or projects into the interior. They may be of almost any size, cases being on record in which they weighed from 70 to 80 lbs. In regard to the symptoms of this affection, it must be premised that sometimes these tumors exist without exciting any disturbance, and that growths on the outer surface give rise to comparatively unimportant derangements, compared with those which are imbedded in the walls, or occupy the cavity of the womb. It will be readily understood that women who have passed the change of life (as it is popularly called) suffer less from these tumors than younger women. The diagnosis of fibrous tumor is effected partly by manual and instrumental examination (into which we shall not enter), and partly by the symptoms—such as (1) hæmorrhage occurring in about 50 per cent. of cases independently of their nature; (2) disturbance of the menstrual discharge of 62 per cent. of cases, it most commonly being excessive, and often painful; (3) usually constant, and occasionally only at the menstrual period, described by some patients as a burning sensation, by others as a sense of bearing down, and by a few as occurring in paroxysms of intense agony; (4) dysuria—pain in voiding urine, or difficulty in discharging it, or frequent desire to pass it. It is usually hæmorrhagic, or inability to void the urine that first directs the attention of the patient to her malady. Its tendency to excite

abortion often leads the physician to suspect its presence. Although, as we previously mentioned, this is an affection little amenable to treatment, a woman with these symptoms should at once consult a physician (if possible, the physician-acconcheur to a large hospital), who, by his advice as to the general management of the case, especially during the menstrual period, may do much to palliate her sufferings. Iodine, bromine (and certain mineral waters containing these elements), and mercury have been vaunted as specifics, but nothing positive can be said regarding their successful action; and certain surgical operations have been recommended, which are accompanied with so much danger to the patient that it is needless to refer to them. But although the action of medicines on these growths is avowedly uncertain, nature in this as in many other cases not unfrequently strives towards a more or less complete cure. For example, if the tumor is pediculated, and lies in the uterine cavity, the pedicle may finally give way, and the tumor may be expelled; or certain changes may take place in the interior of a tumor, leading either to its disintegration and elimination, or to its conversion into a chalky mass, which, though not eliminated, induces no local disturbances. These spontaneous cures are by no means rare, although we can hardly lead the patient to expect them in any special case.

We shall conclude with a few words on a disease which is the most painful and hopeless of all the disorders to which humanity is liable—*cancer of the womb*. It is a disease whose leading features are thus graphically—we may almost say, painfully—described by Dr West: "Pain, often exceeding in intensity all that can be imagined as most intolerable, attended by accidents which render the sufferer most loathsome to herself and to those whom strong affection still gathers round her bed; the general health broken down by the action of the same poison as produces the local suffering, and all tending surely, swiftly, to a fatal issue, which skill cannot avert, from which it can scarcely take away its bitterest anguish." The three most constant symptoms are pain, and hæmorrhage, and discharge. From an examination of 132 cases by the above-named physician, the first symptom was found to have been,

In 58 instances, or 43·9 per cent.,	hæmorrhage without pain.
" 26 " 19·6 "	pain of various kinds.
" 18 " 13·6 "	hæmorrhage with pain.
" 18 " 13·6 "	leucorrhœa or other discharge without pain.
" 12 " 10·3 "	pain and discharge sometimes offensive.

It is unnecessary to enter into further details regarding the symptoms of this disease, as cases of this nature must always be under medical superintendence, and for the same reason we need only say regarding the treatment, that it is divisible into the *palliative* and the *curative*, the former being directed towards the three great symptoms, and the general symptoms of the cancerous cachexia (or constitution), while in the latter are included the operation of extirpating the whole womb, or removing the neck of the womb by ligature or excision. It is difficult to speak with accuracy regarding the frequency of this disease. An approximate estimate may be formed from the fact that, in 1861, the mortality from cancer in England amounted to 1764 males and 4072 females; the excess in the latter case, amounting to 23·8, must be due to cancer of the breast or womb; and according to Tanchon, a French pathologist, cancer of the womb is more frequent than of the female breast in the rate of 26 to 10. Hence the yearly deaths from uterine cancer in England amount to about 1674. The last-named writer calculated, from ten years' observation of the French records of mortality, that this disease causes 16 per 1000 of all female deaths. The disease is very rare before the 25th year, and by far the most common period of its appearance is between the ages of 40 and 50 years. Its average duration is 16 or 17 months, but it may prove fatal in 3 or 4 months. On the subject of cancer of the womb, Walsh "On Cancer" may be consulted; and for further information on the subject of this article generally, the reader is referred to the standard works of Churchill, Lever, Simpson, West, &c.

WOMBAT (*Phascologye*), a genus of marsupial quadrupeds, constituting a distinct family, *Phascologydæ*, and of which only one species is known, *Phascologye*

Wood

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Wombat, a native of Australia, abounding chiefly in mountainous districts of New South Wales, Victoria, South Australia, and Van Diemen's Land, and in the islands of Bass's Strait. In many of its characters, it resembles the *Rodentia*. The incisors are two in each jaw, long, and chisel-like; they are hollow at the base, and continue to grow as they are worn away; there are no canine teeth; and the molars are five on each side in both jaws. There is a wide gap between the incisors and the molars. The W. is an animal of clumsy form, having stout limbs and a blunt muzzle. It is 2 or 3 feet long, plump, with a thick coat of long, grayish brown, coarse, woolly hair; the head large, flat, broad, with small eyes and ears, the upper lip cleft; the feet five-toed, the claws long, except those of the inner toes of the hind feet; the tail very short. It is plantigrade, and the soles of the feet are broad and naked. It is nocturnal in its habits, slow in its motions; feeds on vegetable substances, and digs up roots with its claws; it makes its abode in holes among rocks, or in burrows dug by itself. It produces three or four young at a birth. It is a creature of little intelligence, but gentle, and easily domesticated to a certain extent, not seeming to care much for any change of circumstances, so long as its wants are supplied. It shows considerable suppleness, however, if provoked. Its flesh is preferred to that of any other quadruped of Australia. It is generally fat, and in flavor resembles pork. Wombats have frequently been brought alive to Britain.—The remains of a fossil species have been found in the caves at Wellington Valley, Australia.

WOOD, Anthony, of some note as an antiquary, was born at Oxford in the year 1653. His school education he received chiefly in the place of his birth, and in 1647, he was entered at Merton College as a gentleman commoner. In 1653, he took his degree as Bachelor, and in 1655, became Master of Arts. Deriving from his father an independence, he seems at first to have aimed at being a sort of Jack-of-all-trades, as not bound in penalties of hunger to follow out any particular one. He practised the fiddle assiduously, and is said to have attained considerable skill. Painting was also one of his innocent hobbies, but none of his pictures have been preserved to enable us to test his proficiency. In addition to these accomplishments, it was his whim to concern himself with heraldry and other antiquarian pursuits. He labored much in the libraries and presently came to be noted for his curious turn that way. In 1656, he came upon Dugdale's "*Antiquities of Warwickshire*," shortly before published, the perusal of which greatly delighted him, and awoke in him the fire of emulation. He now worked still more assiduously; and went about among the tombs, copying old inscriptions. As the fruit of these labors, he gave to the world, in 1669, his "*History and Antiquities of Oxford*." For the copyright of this work W. received £100 from the university; and Dr Fell, Dean of Christchurch, thought so highly of it that he employed one Peers, a student, to execute a Latin translation of it. The "*Historia et Antiquitates Universitatis Oxoniensis*" was published at Oxford in 1674.

Subsequently, in 1691, as a result of his further investigations, W. published his "*Athene Oxoniensis*," containing a full and particular account of all the authors, bishops, &c., who had adorned that seat of learning from 1500 to 1690. In this work, he attacked the character of the great Lord Clarendon, deceased; a misdemeanor for which he was prosecuted at the court of the university, and expelled. He did not long survive this disgrace, dying 29th November 1695. His books, and a selection of his manuscripts, he left to the university of which he had ceased to be a member, and they are preserved in the Ashmolean Museum. His life may be found at large in the edition of his "*Athene Oxoniensis*" issued by Dr Bliss in 1848.

WOOD AND WOODY FIBRE. The hard and compact or tough and fibrous parts of plants are composed chiefly of a peculiar kind of Vascular Tissue (q. v.), which, when compact, is *wood*. It exists chiefly in the stems, frequently in the roots, and also in the inner bark of exogenous plants, which yields many of the most valuable fibres used in the arts, and in the midrib and veins of leaves, some very useful fibres being obtained from the leaves of endogens. See **FIBRE**. Annual plants contain little or no woody fibre, being composed chiefly of Cellular Tissue (q. v.), which also forms great part of many herbaceous perennials, and of all plants in a very young state. Woody fibre consists of elongated cells tapering to both extremities, lying close together, and overlapping one another, sometimes much

elongated into tubes. Wood is entirely made up of cells of this kind, permeated in exogenous plants by medullary rays. The cells of woody fibre have their walls thickened by successive layers of cellulose and lignine, deposited in their interior, so that they acquire strength. In the inner bark of exogens, woody fibre is mixed with laticiferous vessels (see *LATEX*) and cellular tissue.

Woody fibre has generally no definite markings on the walls of its cells; but these sometimes appear as simple discs, or as discs with smaller circles in the centre. These discs are formed by concavities on the outside of the walls of contiguous cells, closely applied to each other, so as to form lenticular cavities between them, as Mr Quekett proved in fossil blue-wood, in which he separated lenticular masses of solid matter from between the discs. When the smaller circle appears in the centre of the discs, the woody tissue is described as *Punctated*. This is especially the case in *Coniferae*, but is not absolutely distinctive of them, the same character appearing also in some other plants, as in Winter's Bark. The small circle in the centre of the disc is formed by the mouth of a canal, often funnel-shaped. These canals or pores, connecting one cell with another, are supposed to give to the wood of the *Coniferae* its peculiar fitness for making musical instruments.

Woody fibre is not properly formed unless the leaves of plants are well exposed to the light. There is no doubt that the Cambium (q. v.) performs an important part in the formation of wood. There has been much difference of opinion among vegetable physiologists, however, as to the mode of its formation. Two principal theories have long had and still have their advocates—the *Horizontal* and *Vertical* theories. According to the former—supported by Duhamel, Decandolle, Schielden, Mirbel, Naudin, Henfrey, &c.—the wood of trees is formed by horizontal extension from the stem or from the bark, or from both, for there is much diversity of opinion as to these particulars. According to the latter—supported by Knight, Petit-Thouars, Gaudichaud, Lindley, &c.—the wood is developed in a vertical direction from the leaves, every bud being, as the elder Darwin long ago maintained, an embryo plant sending leaves upwards and roots downwards.

Wood is not only valuable as Timber (q. v.), but for fuel, being the chief fuel used in many parts of the world. To woody fibre we are indebted also for great part of our cordage and textile fabrics, including the very finest of them, as muslin and lace. Reduced to pulp, it is used for the manufacture of paper.

A kind of factitious or artificial wood, used for making ornamental articles, has recently been invented in France. It is called *Bois duré*. It is formed of sawdust, heated to a high temperature, and subjected to very great pressure. Its compactness and hardness exceed those of wood itself. Another kind is made by mixing blood with sawdust, and compressing. Some kinds of costly wood are also imitated by mixing their sawdust with glue, and casting the mixture into the desired shape in moulds.

WOOD-BINE. See *HONEYSUCKLE*.

WOODBRIDGE, a market-town and river-port of Suffolk, on the right bank of the Deben, which here expands into an estuary, 11 miles from the sea, and 8 miles east-north-east of Ipswich. Vessels of 120 tons can reach the town. There are a custom-house, a bonding warehouse, and docks in which shipbuilding is carried on. The church is a striking edifice of black flint and freestone, with a magnificent tower. There is also a richly endowed charity which supports an excellent and well-conducted grammar-school, commodious and extensive almshouses, a public dispensary and library. Corn, flour, and malt are exported; coals imported. In 1875, 378 vessels, of an aggregate tonnage of 20,541 tons, entered the port, and 208, of 11,749 tons, cleared. W. is on the Great Eastern Railway. Pop. (1871) 4403.

WOOD-CARVING is probably the oldest branch of art. Apparently, the first weapon was a club, and the first attempt at decoration was some scratching or carving on it. Amongst the Egyptians, Greeks, and Romans it was much practised. As a branch of Christian art it was one of the earliest, and attained a high development in the 15th century. It greatly declined during the last century, but has again revived, and promises to attain great importance. The wood-carvers of Great Britain have shewn great capabilities, but hitherto have lavished too much care upon fineness of finish rather than on the artistic excellence of their designs.

WOOD-CHARCOAL is the most important, although not the purest, kind of

charcoal. Wood consists of carbon, hydrogen, and oxygen, the last two being in the proportion to form water. When heated in the open air, it burns completely away, with the exception of a small white ash; but if the supply of air be limited, only the more volatile matters burn away, and most of the carbon remains. This is the principle of the process of charcoal-burning in countries where wood is abundant, as, for example, in the Harz Mountains. "A number of billets of wood are built up vertically in two or three rows into a large conical heap, which is covered over with turf or moistened charcoal-ash, holes being left at the bottom for the air to get in. A hollow space is also left in the middle of the heap, to serve as a flue for the gaseous matters which are evolved. The heap is set on fire by throwing burning pieces of wood into the central opening, near the top of which, however, a kind of grate, made of billets of wood, is placed, to prevent the burning fuel from falling at once to the bottom. The combustion then proceeds gradually from the top to the bottom, and from the centre to the outside of the heap; and as the central portions burn away, fresh wood is continually thrown in at the top, so as to keep the heap quite full. The appearance of the smoke shows how the combustion is proceeding: when it is going on properly, the smoke is thick and white; if it becomes thin, and especially if a blue flame appears, it is a sign that the wood is burning away too fast, and the combustion must then be checked, by partially stopping up the holes at the bottom, or by heaping fresh ashes on the top and sides and pressing them down well, so as to diminish the draught. As soon as the combustion is completed, the heap is completely covered with turf or ashes, and left to cool for two or three days. It is then taken to pieces, and the portions still hot are cooled by throwing water or sand upon them. 100 parts of wood yield on the average from 61 to 65 parts by measure, or 24 parts by weight of charcoal."—Watts's "Dictionary of Chemistry," vol. i. p. 759. The charcoal thus prepared is the best suited for fuel. In England, a large quantity of charcoal is obtained in the dry distillation of wood in cast-iron cylinders, for the preparation of crude acetic acid. The charcoal thus prepared is preferable for making gunpowder, but is inferior for other purposes. A peculiar kind of charcoal of a reddish-brown color, and hence termed *charbon roux*, is prepared in France for the manufacture of the gunpowder used for sporting purposes, by subjecting wood in iron cylinders to the action of superheated steam under a pressure of two atmospheres. Powder made with this charcoal absorbs moisture more rapidly than ordinary gunpowder.

The general properties of wood-charcoal are, that it is black and brittle, and retains the form of the wood from which it was derived; it is insoluble in water, infusible and non-volatile in the most intense heat; its power of condensing gases is noticed in the article on that subject; and from its power of destroying bad smells, it has been regarded as possessing considerable antiseptic properties. It is frequently stated that charcoal is a bad conductor of heat, but a good conductor of electricity; these properties depend upon the nature of the charcoal, the lighter wood, such as willow, yielding a porous charcoal, with little power of conducting heat or electricity; while boxwood yields a very compact charcoal, which is a good conductor of heat and electricity, and is admirably adapted for the exhibition of the electric light. Charcoal never consists entirely of pure carbon, the degree of purity varying directly with the temperature; thus, charcoal charred at 450° contains 65 per cent. of carbon, while that charred at 750° contains 80, and that charred at 2780° contains 96; but the loss of charcoal occasioned by these high temperatures is very great, the three percentages of charcoal corresponding to these temperatures being 50, 20, and 15.

The uses of wood-charcoal are numerous and extensive. It is very largely employed as a fuel, taking the same place in many countries that coal occupies here. From its being proof against all ordinary chemical agencies, "a superficial charring is frequently resorted to, with the view to protect wood from decay, as in the case of piles which are driven into mud or into the beds of rivers to serve as foundations. For the same reason, it is a common practice to char the interior of tubs and casks destined to hold liquids."—Miller's "Inorganic Chemistry," 3d ed., p. 77. In a finely-divided state, it is commonly regarded, as has been already stated, as an antiseptic; and there is no doubt that the offensive effluvia from animal matter in an advanced stage of putrefaction disappear when the putrefying substance is covered with a

layer of charcoal; but in reality the decay goes on, without the emission of any odor, till at length the whole of the carbon is dissipated as carbonic acid gas, and the hydrogen as water, while the nitrogen remains as nitric acid. For these explanations, we are indebted to Dr Stenhouse, who has shewn that the action consists in a rapid process of oxidation, dependent upon the power which finely-divided charcoal possesses of condensing oxygen. In a finely-divided state, charcoal not only condenses gases to a marvellous extent, but has the power of absorbing coloring matters, bitter principles, &c.; and hence it is of extensive use in the laboratory. From the rapidity of its absorbing action, "Stenhouse has proposed to use a respirator filled with charcoal to protect the mouth and nostrils in an infected atmosphere; and the employment of trays of powdered wood-charcoal in dissecting-rooms, in the wards of hospitals, and in situations where putrescent animal matter is present, is found to exert a most beneficial influence in sweetening the atmosphere, by absorbing and decomposing the offensive gases. These properties render charcoal a valuable material in the construction of filters, not only for decolorising purposes, but likewise for assisting in purifying water for domestic use. It is now also employed most successfully to prevent the escape of noxious vapors at the ventilating openings of the sewers, as it allows the free passage of air, but condenses the offensive effluvia in its pores, where they are destroyed by a process of oxidation.—Miller, *op. cit.*, p. 78. Besides its employment in the manufacture of gunpowder, it has many applications in the arts. In Medicine, it is at present chiefly used to destroy fetor; for which purpose it is applied in the form of powder or poultice to gangrenous sores, phagedenic ulcers, &c.; it is also largely employed in tooth-powders, as by its mechanical action it removes incrustations, while by its chemical action it destroys fetor of the breath. In indigestion, accompanied by much flatulence, it may be given in doses of two or three tea-spoonfuls suspended in water, or may be administered in the form of charcoal-biscuits. Very finely divided poplar charcoal is regarded as the best for medicinal uses.

WOODCHAT (*Lanius rutilus*), a bird which, notwithstanding its name, is not a species of Chat, but of Shrike (q. v.). Its whole length is about seven inches and a half. The upper parts are mostly black, the under parts white; but there is a white spot on the wing when closed, and other small portions of the wing-feathers are white, as well as the outer tail-feathers, and there is a narrow streak of white above the base of the bill on each side; the crown of the head and nape of the neck are rich chestnut-red. The W. is a rare bird in Britain, but is abundant in the southern parts of Europe. It may be regarded as an African bird, being found from the Mediterranean to the Cape of Good Hope. In Europe, it appears only as a summer visitant, but in Africa it occurs at all seasons of the year.

WOODCHUCK (*Arctomys monax*), a species of Marmot (q. v.), inhabiting North America, from Hudson's Bay to South Carolina. It is from fifteen to eighteen inches long, blackish or grizzled above, chestnut red below; the form thick, the head broad and flat, with almost no apparent neck, the legs short and thick, the feet large, the tail bushy. The hair is rather soft, the whiskers long and stout. This animal digs deep holes in fields, on the sides of hills, or under rocks in woods; its burrow slants upwards, so that water may not enter, and within are several compartments. It passes the winter in the burrow, in a lethargic state. The food of the W. is vegetable, and it is particularly destructive to crops of red clover. It is easily tamed, and may be fed on bread, milk, and vegetables. It fights successfully with a dog of equal size. The name of Ground Hog is sometimes popularly given to it. Its flesh is sometimes eaten, but is rank.

WOODCOCK, the popular name of certain birds commonly regarded as of the same genus with the Snipes (q. v.), but of more bulky form than the true snipes, and having shorter and stronger legs. The **Common W.** (*Scelopax rusticola*), well known as a game-bird in Britain, and highly esteemed as a delicacy for the table, is found also in all parts of Europe and the north of Asia. It is one of the birds of Japan. It is only a winter visitant of most parts of Britain, very rarely breeding in England, but it more frequently breeds in the northern parts of Scotland. Its summer haunts are chiefly the pine forests of the northern parts of Europe and Asia; but in summer it inhabits higher and dryer ground than in winter, when it is chiefly to be

found in moist woods and swamps, seeking for worms, snails and slugs as food, boring with its long bill in the soft ground. The quantity of food which it devours is very great; a single W. has been known to consume in a night more earth-worms than half-filled a garden pot of moderate size. The W. is about thirteen inches in length; the upper parts varied with ruddy, yellowish, and ash color, finely intermingled, and marked by large black spots; the lower parts yellowish red, with brown zigzag lines; the quills striped with red and black on the outer edge; the tail feathers tipped with gray above and white below. The female is rather stouter and larger than the male, and sometimes a weight of fourteen or fifteen ounces. A W. of twenty-seven ounces is on record. The W. makes its nest in warm, dry situations on the ground, of dead leaves loosely laid together. It lays only three or four eggs of a pale yellowish or reddish brown color. As woodcocks usually breed in very dry situations in the recesses of thick woods, the young ones would be left to starve but for the peculiar adaptation which enables the parent to transport them to moist feeding grounds. It was long believed that the female W. used only her feet for carrying her young from place to place; but Mr. Charles St John, in his "Natural History and Sport in Moray," says, that from close observation he found that "the old woodcock carries her young, even when larger than a snipe, not in her claws, which seem quite incapable of holding up any weight, but by clasping the little bird tightly between her thighs, and so holding it tight towards her own body." The W. feeds chiefly by night. Great numbers sometimes appear in some parts of Britain, in their migrations. Besides falling to the gun of the sportsman, they are sometimes caught by nets placed in the tracks or open glades in woods, by which they proceed from their retreats to their feeding-grounds, and by nooses or springs set about the places which they frequent.—The AMERICAN W. (*Scolopax* or *Philohela minor*) is a smaller bird than the W. of Europe, being only about eleven inches long; very similar in plumage and habits. Three transverse black bands mark the hinder part of the head. It is found in all parts of North America, and is greatly esteemed for the table.

WOOD-ENGRAVING, or Xylography, the art of engraving designs on wood, differs from copper and steel plate engraving by having the parts intended to print on the paper, in relief. While plates are printed from the engraved lines by a laborious and necessarily slow process (see ENGRAVING), wood-engravings, having the object to be represented on the surface, in the manner of a type, may be printed along with the matter it is intended to illustrate in the ordinary printing-machine. This, of course, is an important point in the illustration of books, on the grounds of cheapness and expedition. Another advantage wood-engravings possess is, that they can be multiplied to any extent by means of the Stereotype (q. v.) and Electrotype (q. v.) processes.

The invention of wood-engraving, like that of gunpowder, has been claimed for the Chinese, whose books have certainly been printed from engraved wood-blocks for ages. It has indeed been asserted that the art of cutting figures in relief, and printing impressions of them on paper, was known and practised by that nation as early as the reign of the renowned Emperor Wu-Wang (1190 B.C.). There is no doubt that wood-stamps were used by the ancient Egyptians and Romans for stamping bricks and other articles of clay; and that wood and metal stamps of monograms, &c., were used in various European countries, for attesting deeds and other documents, at a very early period, when the ability to write was an extraordinary accomplishment even for princes. It is not, however, until the beginning of the 15th c. that we find any evidence of the existence of wood-engraving, as we now understand it. It appears to have been used in Germany at that time for printing playing cards and figures of saints. The earliest print of which any certain information can be obtained is in the collection of Earl Spencer. It was discovered in one of the most ancient convents of Germany—the Chartreuse of Buxheim, near Memmingen in Bavaria—pasted within the cover of a Latin MS.; it represents St Christopher carrying the infant Saviour across the sea, and is dated 1423. It is a work of some merit, notwithstanding its apparent roughness; the infant Saviour and the drapery of the saint being drawn with considerable skill and vigor. The inscription at the bottom has been thus translated: "In whichever day thou seest the likeness of St Christopher, in that same day thou wilt, at least, from death no evil blow incur.—1423." Shortly afterwards, a series of books, printed

entirely from wood-engravings, called block-books, were issued. They consisted principally of religious subjects, with short descriptions engraved on the same block. The most important of them were the "Apocalypsis, seu Historia Sancti Johannis;" the "Historia Virginitatis ex Cantico Cantecorum;" and the "Biblia Pauperum," the last containing representations of some of the principal passages of the Old and New Testaments, with explanatory texts. The illustrations, of which Mr Jackson, in his treatise on the "History and Practice of Wood-engraving," gives an elaborate account and several specimens, seem to be drawn with a supreme contempt for perspective and proportion, but bear evidence of the draperies, and hands and faces, having been carefully studied. Previous to the invention of movable types, whole books of text were also engraved on wood, and the impressions had evidently been taken by *rubbing* on the back of the paper, instead of steady pressure, as in the printing-press, the ink used being some kind of distemper color.

The Psalter printed by Faust and Schöffer at Mentz in 1457 (see GUTENBERG), is illustrated with initial letters engraved on wood, and printed in two colors, blue and red, which Mr Jackson considers "the most beautiful specimens of this kind of ornament which the united efforts of the wood-engraver and the pressman have produced. They have been imitated in modern times, but not excelled." It is worthy of note, that although printed upwards of 400 years ago, the freshness and purity of the colors remain unimpaired.

As printing spread, the publication of illustrated books became general in Germany and Italy, and reached England in 1476; in which year Caxton (q. v.) published the second edition of the "Game and Playe of the Cheesc," with figures of the different pieces. They are very rude, compared with the earlier German works. The first attempt at something finer than simple lines appears in the frontispiece to the Latin edition of Breydenbach's "Travels," printed at Mentz by Erhard Renwich, 1486. It is by an unknown artist, and is an elaborate and really very beautiful specimen of the art. It is also remarkable as being the first engraving introducing *cross-hatching* to represent dark shadows. The "Hypnerotomachia Poliphili," printed at Venice by Aldus, in 1499, is worthy of mention for the extreme beauty of the designs, which have been ascribed by some authorities to Raphael, and by others to Mantegna. About the beginning of the 16th c., a complete revolution in the art of wood-engraving was accomplished by the genius of Albert Dürer. His productions exhibit not only correct drawing, but a knowledge of composition and light and shade, and attention to the rules of perspective, which, with the judicious introduction of subordinate objects, elevated them to the rank of finished pictures. Dürer, however, in common with most of the German artists of his day, paid very little attention to the propriety of costume in his religious subjects; one of his drawings in the "History of the Virgin" (1511), for instance, representing the birth of the Virgin, shews the interior of a German burgomaster's house of his own day, with a number of gossips drinking from flagons, and otherwise enjoying themselves. There has been considerable discussion as to the probability of Dürer having also *engraved* his drawings. Most of the best authorities on the subject, including Bartsch, Jackson, and Firmin Didot, agree in the negative. Mr. Jackson, who speaks with the experience of a practical engraver, says: "In most of the wood-cuts supposed to have been engraved by Albert Dürer, we find cross-hatching freely introduced: the readiest mode of producing effect to an artist drawing on wood with a pen or a black-lead pencil, but which, to the wood-engraver, is attended with considerable labor. Had Albert Dürer engraved his own designs, I am inclined to think that he would have endeavored to attain his object by means which were easier of execution." The reader is referred to the article DÜRER for an account of some of his numerous works. The best of Dürer's contemporary artists on wood were the painters, Hans Burgkmair (q. v.), Lucas Cranach (q. v.), and Hans Schänfflein. A series of works projected by the emperor Maximilian, including "The Adventures of Sir Theurdank," "The Wise King," "The Triumphs of Maximilian," &c., were illustrated by these artists; but they are not equal to those of Dürer.

During the first half of the 16th c., the publication of books illustrated with wood-engravings still increased, and prevailed to a greater extent than at any other time, with the exception of the present day. The superiority of talent, both in drawing and engraving, however, still remained with the Germans. In France,

although their figure-subjects were inferior to those of their German neighbors, their ornamental borders in prayer-books, &c., of which a great number were printed at this time, were extremely beautiful. In Italy and England, the art was very far behind. The most remarkable work published at this time was the "Dance of Death" (q. v.), issued at Lyon in 1538. The original edition of this curious work contained 41 engravings, representing the struggle between death, generally in the form of a skeleton, and different individuals, such as the Pope, the Emperor, a Judge, Monk, Doctor, Duchess, Old Man, &c. The drawings, which are characterised by great vigor and skill, are generally understood to have been executed by Hans Holbein (q. v.); but whether he also engraved them, as has been alleged, is more than doubtful. Towards the conclusion of the century, however, the art had made considerable progress in Italy, where some of the best productions of Germany were equalled, if not excelled. In England, it did not make much progress. John Daye published almost the only illustrated books of the time, notably Queen Elizabeth's Prayer-book, which contains a tolerably well executed portrait of her Majesty. There is no certain knowledge about any of the artists or engravers, although John Daye is supposed to have engraved some of his cuts himself. At this time also, the practice of printing wood-engravings in colors from different blocks became somewhat common, although the attention of artists in that line was mostly confined to ornamental subjects. From the beginning of the 17th c., the decline of wood-engraving may be dated; Germany, the cradle of the art, being the first to forsake it; the only works worthy of notice were a series of blocks on various subjects—designed by Rubens, and engraved by Christopher Jegher of Antwerp, one of the best wood-engravers of that period—some of which are of great beauty. From this time, the art fell into a state of great neglect, not, apparently, for want of engravers, for wood-cuts of a certain kind were always produced, but for want of artists able, or willing, to make drawings worthy of preservation.

Nothing particularly deserving of notice occurred until 1766, when John Michael Papillon, an enthusiastic professor of the art in France, published an elaborate history of the subject in an unsuccessful attempt to restore it to its former importance. But it was not until the genius of Thomas Bewick (q. v.) was brought to bear on it, that wood-engraving received that impetus which has made it what it now is—one of the most important of the illustrative arts. Bewick's most important works are his "Histories of British Quadrupeds" (1790) and "British Birds" (1804); all the quadrupeds, and almost all the birds were drawn and engraved by himself. The birds, especially, are executed with a truthfulness and skill which has rarely if ever been equalled. These works are also famous for their collection of tailpieces, which display an infinite amount of humor and pathos. He entirely abandoned the elaborate system of "cross-hatching" which prevailed so much in the works of the older engravers, and produced his light and shade by the simplest possible means.

Since Bewick's time, wood-engraving has continued to flourish without interruption. He left behind him several pupils, the most successful of whom were Needel, Clennell (who engraved some of the tailpieces in the "British Birds"), and William Harvey. Harvey, however, forsook the burin for the pencil; and his drawings illustrating Milton's "Paradise Lost," Thomson's "Seasons," &c., especially such as were engraved by John Thomson (perhaps the most skilful engraver that ever lived, and a pupil of Robert Bannister, a self-taught engraver), still retain a first-class place as specimens of wood-engraving. The establishment of the "Illustrated London News" (1842) tended greatly to familiarise the public with the beauties of wood-engraving. In the pages of that periodical appeared the first drawings on wood of Messrs John Gilbert and Birket Foster. The spirited figure-subjects of the former, and the exquisite landscapes of the latter, have done much to raise the art to the very high place it now occupies in England.

Of late years, the art has also made very great progress in France and Germany. The style of engraving, however, is quite different from the English, so much so, that a practised eye can distinguish a French wood-cut at a single glance. The professors of the arts of drawing and engraving on wood in the present day are so numerous, and their works generally so well known, that it would be needless, even if our space permitted, to attempt even to enumerate them.

Practice of Wood-engraving.—The wood used for engraving is boxwood, which has the choicest grain of any wood hitherto discovered. It is principally imported

from Turkey for the purpose, as the English box is too small to be of much use. It is cut *across* the grain in slices, which are dressed to the same height as type, for convenience in printing. Inferior kinds of wood, such as American rock maple, pear tree, plane tree, &c., are used for coarser purposes; and for very large and coarse subjects, such as posting-bills, common deal is used, and cut on the *side* of the wood with chisels and gouges. When *blocks*—as the pieces of wood are termed—are required of a larger size than a few inches square, it is necessary to join two or more pieces together, as the amount of *sound* wood to be got out of even a large slice is extremely limited. There is, however, for all practical purposes, no limit to the joining process, as blocks have been printed consisting of from 50 to 100 pieces. The wood having been made very smooth on the surface, and squared to the required size, is prepared for the artist by being covered with a preparation of white (commonly water-color Chinese white); this gives a very good surface for the pencil to work on. The subject is then drawn in the ordinary way, the tints being generally washed in with India-ink, and the details filled in with pencil. When the drawing is finished, it is given to the engraver, who, previous to commencing, carefully covers the block with paper, fastened round the edges with beeswax; this is necessary, to avoid rubbing the drawing out in the process. As the engraving proceeds, he gradually tears the paper off.

The tools or gravers necessary in wood-engraving are of three kinds—viz., gravers proper, tint-tools, and scoopers or cutting-out tools, for clearing out the larger pieces. They are arranged in different sizes, to suit the different portions of the work. Most engravers use a glass of slight magnifying power, more for the purpose of relieving the eyes from the strain of fixing both eyes closely on a small object, than for magnifying the work. When gas or other artificial light is used, a glass globe filled with water, slightly tinted with blue (to neutralise the reddish glare of the light), is placed between the flame and the work: this serves the double purpose of concentrating the light on the block, and keeping it out of the eyes. When the drawing is in outline, or mostly so, the engraving is very simple: the process consists of engraving a line along each side of the pencil lines, which are, of course, to be left in relief and afterwards cutting out the pieces between. It will thus be understood that every part of a wood-cut which prints on the paper is the surface of the wood left untouched, and that every white part is cut or hollowed out. When it is complicated with much shading, trees, &c., it becomes much more difficult, and brings into play the artistic talents of the engraver to preserve the proper shades, or *color*, as it is technically termed, and texture of the different objects. Some engravers of the present day are celebrated for their power of producing beautiful pictures altogether by “graver-work” from drawings made entirely with the brush. Skies and flat tints are engraved with tint-tools which, from their shape, are best adapted for cutting straight lines; and by the judicious use of the different sizes, the lines are left wider or closer, thicker or thinner, as the tint is wanted darker or lighter. As already mentioned, the tools are arranged in sizes—i. e., those for light tints are broader at the points than those for dark tints, so as to cut out more white. Trees, foregrounds, &c., are cut with *gravers*, which, as they are like a lozenge in shape, give more scope for freedom of handling.

When the drawing is all engraved, a proof is taken by inking the surface gently with printing-ink on a dabber (a ball of cotton covered with silk), and a piece of *India-paper* being laid on it, by rubbing the paper with an instrument called a *burnisher*, until it is all printed. The engraver then sees what touching up is required—a light part to be softened here, a hard dark part to be tumbled down there, &c.—before it is finished and ready for the printer.

When large blocks are to be engraved, the pieces of wood are joined with screw-bolts, and the drawing prepared in the usual manner; after which the pieces can be taken separate for convenience in engraving, and also for the purpose of getting it quicker finished, by having an engraver working at each piece—a matter of some consequence in many cases, as, for example, in the large engravings in the illustrated newspapers.

As wood-engraving, however, is at the best but a slow process, it is not surprising that many attempts have been made to introduce a substitute for it. The point aimed at is to produce by some process of etching (see *ENGRAVING*), or otherwise,

an engraving in relief, directly from the drawing of the artist, without the intervention of the engraver at all. Many processes have been invented for this purpose. The only two which deserve any extended mention are the *Graphotype Process* (q. v.), and *Leitch's Process*. In the former, the drawing is made on finely-prepared chalk, with silica; this hardens the lines drawn, and the soft parts are rubbed out with a brush, leaving the lines in relief. From this a stereotype is taken. In Leitch's process, the drawing is transferred to stone like an ordinary lithograph (q. v.) and a proof—printed in ink capable of resisting acid—transferred to a plate of rolled zinc, and the white parts bitten out. The drawing may also be photographed directly on the zinc. In conjunction with photo-lithography, this process has been extensively applied to the reproduction of maps, &c., for surface printing.

See Jackson and Chatto's "History and Practice of Wood-engraving" (new ed., Lond., 1861); Papillon's "Traité de la Gravure en Bois" (Paris, 1766); Bartsch's "Peintre-graveur;" Otley's "Inquiry into the History of Engraving on Copper and Wood;" Firman Didot, "Essai sur l'Histoire de la Gravure sur Bois" (1863).

WOOD-LOUSE (*Oniscus*), a Linnæan genus of Crustacea, now forming the family *Oniscidae*, of the order *Isopoda*. The antennæ are four in number, but two of them are very short, consisting of two joints at most; the other two are long and slender. The tail is very short, but is composed of six segments. Wood-lice are terrestrial, and the respiratory organs are completely enfolded by plates developed from the abdominal members; the anterior plates being perforated by a row of small holes, through which the air has access to the gills. They frequent damp situations, and are generally found in dark and concealed places, under stones, in holes of walls, under the decaying bark of trees, &c. They feed on decaying animal and vegetable matter. They run with some celerity when apprehensive of danger, and sometimes also roll themselves up into a ball, so as to exhibit only the plates of the back. The eggs are enclosed in a pectoral pouch. The common *W. (Oniscus asper)* is very abundant in Britain, and is to be found in almost every locality suitable for it. It is popularly known in Scotland by the name of *Slater*.

WOOD-OIL, the name commonly given by Europeans in India to a balsamic fluid not really an oil, obtained from the trunks of trees chiefly of the order *Dipterocarpaceæ* (q. v.). The wood-oils of Indian commerce are generally named from the countries or places from which they are brought, and it is not yet known what trees yield particular kinds, although it is certain that most of them are produced by species of *Dipterocarpus*. The name *Gurgina Balsam*, or *Goorjun Balsam*, is frequently given to one of the most common kinds, the produce of the Goorjun tree, *Dipterocarpus turbinatus*, and other species of *Dipterocarpus*. Wood-oil is produced chiefly on the Burmese coast and in the more southern and eastern regions. It is obtained by tapping the tree, and applying heat to the incision; or by felling the tree, cutting a hole in the trunk, and kindling a fire in it, a groove being made for the exuded fluid to flow into pots placed to receive it. The trees which produce it being often very large, a single tree sometimes yields seven tons of oil. Wood-oil is used in medicine as a substitute for Copaiva (q. v.), and in the arts as a varnish, often in combination with colored pigments, and even as a substitute for tar in paying the seams of shipping. It is very effectual in preserving timber from the attacks of white ants. It is sometimes used in making lithographic inks. Wood oil has a fine aromatic odor, resembling that of cedar. When allowed to remain at rest for some time, it separates into two layers, the upper consisting of a clear, chestnut-colored liquid balsam, and the lower a kind of resin in flakes. It is, of course, this resinous part only which remains when it is used as a varnish, and the varnish has dried.

WOODPECKER (*Picus*), a Linnæan genus of birds, now divided into a number of genera, and belonging to the family *Picidae*, of the order *Scansores*. The toes are in pairs, two before and two behind, with sharp strong claws; the bill is rather long, straight, and wedge-shaped, with a hard tip, the tip and sides compressed; the tail is usually lengthened and rigid, although in some it is short and rounded; the vertebrae of the neck are greatly developed, and the last of the caudal vertebrae is very large, with a long ridge-like spinous process; the whole structure adapting these birds to run and climb with the greatest facility on the stems and branches of trees,

in which they aid themselves by the tail, like Creepers (q. v.), and to seek their food, which consists chiefly of insects and their larvae, by digging in the bark and wood of trees with their bill. In addition to the particulars already noticed, they have the tongue fitted to serve as an important instrument in obtaining their food; the branches of the hyoid bone being greatly elongated backwards, and in front moving as in a sheath; a peculiar arrangement and development of muscles enabling them to extend the tongue far beyond the bill; its tip being horny, and furnished with barbed filaments, whilst its surface is covered with a glutinous saliva, secreted by two large glands. Their powers of flight are very moderate, and the keel of the breast-bone is small. The Barbets (q. v.) and Wrynecks (q. v.) are referred to the family *Picidae*. Woodpeckers are diffused over almost all parts of the globe, but abound chiefly in warm countries. The species are very numerous. They are mostly solitary in their habits, and live in the depths of forests. They feed in part on fruits and seeds as well as on insects; but much of their time is spent in pursuit of these, and they may be heard at a considerable distance, tapping the wood of trees with their bill, to discover the place where an insect is lodged, and to get at it when discovered. The common notion, that they are very injurious to trees, is erroneous, as they do more good by preventing the ravages of insects than harm by their pecking. They strike out chips of wood with their strong bill, and in this way enlarge holes in decayed parts of trees for a roosting-place or a nest, carrying away the chips to a distance, especially in the case of a nest, as if for precaution that it may not be discovered. The nest consists of a mere hole in a tree, perhaps with a few chips in the bottom of it, but with no other lining. The plumage of woodpeckers is generally of strongly contrasted colors, black and white, or green and yellow, with red marks about the head. There are several well-marked groups of woodpeckers, differing in form, plumage, and habits, which also are of different geographic distribution, some of them being entirely, and some chiefly confined to particular parts of the world.

Only four species are found in Britain, and one of them, the **GREAT BLACK W.** (*Picus* or *Dryocopus martius*), is of rare occurrence. It is about sixteen inches long; black, with a red cap on the head. It is found in the pine-forests of many parts of Europe.—The **GREAT SPOTTED W.** (*P. major*), also called **FRENCH PIE** and **WOOD PIE**, is not uncommon in some parts of England, but is rare in Scotland. It is found on the continent of Europe from Norway to the Mediterranean. It is about nine inches and a half in length. The color is black, varied with white, the under parts grayish white; the back of the head in the male bright scarlet. The **LESSER SPOTTED W.** (*P. minor*) is not uncommon in the south of England. Its whole length is about five inches and three-quarters. It is widely distributed in Europe and the north of Asia. Its colors are similar to those of the last species, but differently arranged. It is frequently to be seen searching for insects on the moss-covered branches of orchard trees.—The most plentiful of all the British species of W. is the **GREEN W.** (*Picus* or *Gecinns viridis*). It is found in the wooded parts of Scotland as well as in England, but is rare in Ireland. It is common on the continent of Europe from Scandinavia to the furthest south. It is about thirteen inches in length; and is mostly of a dark-green color, tinged with yellow; the feathers over the nostrils and round the eye, black; the crown and back of the head, bright scarlet, a black moustache extending backwards and downwards from the base of the lower mandible, with a brilliant scarlet patch along the middle of it; the edges and tips of the wings spotted, black and white. It chiefly inhabits elm and ash trees, making its roosting-place and nest in them in the manner already described. Among its popular English names are *Woodpeck*, *Yaffle*, *Whetle*, and *Woodcall*. The Green W. belongs to a group or section of woodpeckers entirely confined to the Old Continent, and which are more frequently to be seen seeking their food on the ground than the more typical species. The American species of W. are very numerous, and some of them, which want of space prevents us from describing, are amongst the best known birds of the United States and Canada; as the **HAIRY W.** (*Picus villosus*), which is to be found at all seasons in woods, orchards, fields, and even in the midst of cities, visiting farm-yards in winter to pick up grain—a lively, noisy, and active bird; the **IVORY-BILLED W.** (*Picus* or *Campelophitus principalis*), which inhabits the southern parts of the United States and Mexico; is called *Carpenter* by the Spaniards, from the great quantity of chips which it makes; and is valued by the Indians for its ivory.

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like bill and scarlet crest, which they use as ornaments. The **RED-HEADED W.** (*Picus* or *Melanerpes erythrocephalus*) is very common in most parts of North America, and feeds much upon fruits and upon young heads of Indian corn, so that a reward is given for killing it. The largest species in the northern parts of America is the **BLACK W.**, or **LOGCOCK** (*Picus* or *Dryotomus pileatus*), which is about eighteen inches long, the general color greenish black, with stripes of white from the eyes along the neck and sides. The genus *Picumnus* is the type of a group of *Picidae* called *Piculets*, very small birds, with bill hard at the tip, broad rounded wings, and a short tail with broad rounded feathers, not used for support, departing from the typical characters of the family. They inhabit the warm parts of South America, India and the Eastern Archipelago.

WOOD-PRESERVING. Several processes have been employed of late years for the purpose of preventing the decay of wood from damp, atmospheric action, or the destructive operations of animals and parasitic plants. The principle in all has been the same—viz., the injection into the vessels of the wood of some mineral material, which, by combining with the albumen of the woody tissue, prevents its decomposition, or gives it a poisonous character. The chief of the methods in use are that called **Kyanising** (q. v.), **creosoting**, in which the preserving material is the so-called **creosote**, or crude carbolic acid of coal-tar, and the **Boucherie process**, chiefly used on the continent. In this last, a solution of sulphate of copper is used. Whilst the tree is still growing, the head of the tree is cut off, and the top of the bare stem is hollowed into the form of a bowl, which is then filled with the solution, which is afterwards supplied as required. The liquid penetrates downwards, killing the tree as it goes, but giving to the wood a most remarkable degree of durability, particularly when applied to such purposes as railway sleepers, &c.

WOODRUFF (*Asperula*), a genus of plants of the natural order *Rubiaceæ*, containing a number of annual and perennial species, with whorled leaves, natives of the northern parts of the Old World, and distinguished by a funnel-shaped or bell-shaped corolla, a bifid style, capitate stigma, and dry didymous fruit. The **SWEET W.** (*A. odorata*) is common in shady woods in Britain and all parts of Europe. It has a creeping root, a stem 5—10 inches long, weak and sub-erect, four or five whorls of lanceolate leaves, 6—8 in the whorl, rough at the edge and keel, and small white flowers. The plant, when dried, has a very agreeable fragrance, similar to that of *Anthoxanthum odoratum* (see **VERNAL GRASS**) under similar circumstances. It forms an agreeable herb-tea, and enters into the composition of the popular *May-drink* of the Germans.—**DYER'S W.** (*A. tinctoria*) is a native of the continent of Europe and of Siberia, a perennial, with reclining stems about a foot in length, whorls of six or four linear leaves, the upper leaves opposite, the flowers whitish. The root is used in Dalmatia and elsewhere instead of madder; but the crop obtained from a field is inferior in quantity to that of madder.

WOODS AND FORESTS, AND LAND REVENUES. Commissioners of. In ancient times, the principal part of the royal revenues of England, consisted of the rents and profits of the crown-lands, which were composed of numerous lordships and honors, with forests and chases. The demesne lands reserved to the crown at the Conquest were at one time very extensive; but while they were often added to by forfeitures, they were also so largely encroached on by grants to subjects, that from the 12th to the 14th century, parliament had often to interpose to compel the resumption of grants thus made. The confiscation of the property of the monasteries under Henry VIII., greatly increased the real estate of the crown; and, notwithstanding alienations by that monarch and by Queen Elizabeth, who disposed of part of the royal domains, to avoid application to parliament for supplies, the crown, at the accession of James VI., owned very extensive estates all over England. The profusion, however, of James and his successors reduced the royal estates to insignificance, and no effectual restraint was imposed on their dilapidation until statute 1 Anne, c. 1, prohibiting all alienations of the crown-lands, except by leases not exceeding 81 years, or three lives. From the reign of Henry VIII. to that of George III., the crown revenues were subjected to repeated changes of management; and under George III., the system was first introduced of surrendering the greater part of them to be

consolidated with the rest of the public revenue, out of which the royal civil list is paid. The modern administration of the land revenues of the crown is founded on a statute of 1810, establishing a Board of not less than two, or more than three Commissioners, called "The Commissioners of his Majesty's Woods, Forests, and Land Revenues." The law relating to the management of the crown-lands was consolidated by act 10 Geo. IV. c. 50, which, repealing a number of previous enactments on the subject, placed the whole hereditaments of the crown in England, Wales, and Ireland, except advowsons and vicarages, under the management of the Commissioners of Woods and Forests, with large power of selling and leasing them; and provided that the annual land revenues should, subject to certain deductions, be carried to the Consolidated Fund during the king's life. This transfer to the Consolidated Fund, the result of a special agreement terminating with the life of the sovereign, has been renewed with his successors. Act 2 and 3 Will. IV. c. 112, empowered the Treasury to transfer to the Commissioners of Woods and Forests the management of the crown-lands of Scotland.

A large addition was made to the duties of the Commissioners of Woods and Forests by 2 Will. IV. c. 1, which, abolishing the office of Surveyor-general of his Majesty's Public Works and Buildings, intrusted to them the management of the public works. This union, however, was afterwards considered inexpedient, and act 14 and 15 Vict. c. 42, removed the department of Public Works from the Woods and Forests, and placed it under separate control. The act 29 and 30 Vict. c. 62, introduced various alterations in the details of management. The Commissioners of Woods and Forests act under the control of the Treasury, and are required to transmit annual accounts of the receipt and expenditure of their department, to be audited by the Commissioners for auditing Public Accounts. The yearly receipts from this source amount to about £375,000. See WORKS, BOARD OF.

WOOD-SORREL. See OXALIDEÆ.

WOODSTOCK, a small town and parliamentary borough, Oxfordshire, 8 miles north-north-west of the city of Oxford. The pop. (1871) of the borough (which includes several adjacent villages and hamlets) is 7477, and is much larger than that of the town, which contains only 1200 inhabitants. The manufacture of faxn-skin gloves gives employment to about 1200 persons, residing in the town and neighboring villages. W., or rather O.d W., a little to the north of the present town, was a residence of the early English kings; but no remains of the ancient palace exist. Edward, the Black Prince, was born here; Elizabeth was also held here prisoner by her sister Mary; and Chaucer resided here for some time. W. is also famous in connection with Fair Rosamond, the celebrated mistress of Henry II. It is now doubted, however, if the labyrinth or maze which Henry is said to have constructed for her behoof ever existed. In the immediate vicinity is Blenheim Park, the seat of the Duke of Marlborough. W. returns one member to the House of Commons.

WOOD-SWALLOW (*Artamus*), a genus of birds, resembling swallows in many of their habits, but differing in the structure of their bills and feet, and belonging to the family of *Ampelidæ*, or Chatterers (q. v.). The bill is very broad at the base, and arched; the upper mandible thick, but not ridged; the gape furnished with bristles; the nostrils wide apart, naked; the feet short and strong; the wings very long and pointed; the tail short. Their flight is rapid. Their food consists chiefly of seeds. They are natives of the East Indies and of Australia. An Australian species (*A. sordidus*) is sometimes seen in great numbers, and is remarkable for the habit of suspending itself in clusters on dead branches, like a swarm of bees, one bird clinging to another, so that as many thus hang together as would fill a bushel.

WOOL is a variety of Hair (q. v.). The term hair is applied, in ordinary language, to a smooth, straight-surfaced filament like human or horse hair, without serrations of any kind on its surface. Wool, on the other hand, is always more or less waved, besides which, externally each woolly filament is seen under the microscope to be covered with scales overlying each other, and projecting wherever a bend occurs in the fibre. Upon the minute points of difference the value of wool chiefly depends, especially with regard to the great variety of its applications. If each fibre were straight and smooth, as in the case of hair, it would not retain the twisted state

given to it by spinning, but would rapidly untwist when relieved from the force used in spinning; but the wavy condition causes the fibres to become entangled with each other, and the little projecting points of the scales hook into each other, and hold the fibres in close contact. Moreover, the deeper these scales fit into one another, the closer becomes the structure of the thread, and consequently of the cloth made of it. This gives to wool the quality of *Pelting* (q. v.). By combing, or drawing the wool through combs with angular metal teeth, some of the scales are removed, and the points of many more are broken off, so that wool which has been combed has less of the felting property, and is consequently better adapted for light fabrics; and yarn made of such wool is called *worsted*, and the cloths made of it *worsted goods*. But such is the variety of wools obtained by careful breeding and selection, that these differences can be got without combing, some wools being found to have naturally fewer serratures, and a less wavy structure, than others. These are consequently kept separate, and are called *combing-wools*; whilst those which are much waved, and have many serratures, are called *carding-wools*, from their being simply prepared for spinning by carding-machines. The serratures or points of the scales are exceedingly small, and require the aid of a good microscope to see them. They vary from 1200 up to 3000 to an inch.

Wool is the most important of all animal substances used in manufactures, and ranks next to cotton as a raw material for textile fabrics. Its use as a substance for clothing is almost universal in the temperate regions of the globe.

Previous to 1791, British woollen cloths were made almost wholly of native-grown wools. At that time, the whole supply of the country could not have much exceeded 100,000,000 lbs. The merino wool of Spain then began to displace them in the best kind of goods, and the imports from that country reached their maximum in 1805, being in that year 7,000,000 lbs. Before 1820, the German wool had begun to supersede the Spanish, and was imported largely till 1841. After that, the cheaper wool of the British colonies to a great extent took the place of the German, and the latter is now chiefly used for only the finest cloths.

Wool varies in character according to the peculiar breed of sheep which yields it, and also with the nature of the soil, food, shelter, and climate. In a wool of first-rate quality, the fibres are fine, soft, elastic, sound, of good color, and free from deleterious or troublesome impurities: the commercial value of any sample depends, therefore, upon the extent to which it possesses these properties. If it be a combing wool, it will also depend upon its length of staple.

For technical purposes, shorn fleeces are divided into two classes, one called *hogs or tegs*, the other *wethers or ewes*. The former are the first fleeces shorn from the sheep, the latter are those of the second and succeeding years; but the meaning of these terms varies a little in different districts. The fleeces of yearlings are, as a rule, longer in the staple, and otherwise of superior quality to the wool of older animals. In the south of England, it is customary to clip lambs, and the wool so obtained is called *shorn lamb's wool*. Wool taken from the skins of slaughtered sheep is called *skin-wool* or *pelt-wool*, and is of a more variable quality than fleece-wool, on account of its being obtained in all stages of growth.

As long-stapled wools are used for worsted goods, and short-stapled for woollen goods, the various breeds which yield these two leading kinds are naturally divided into the long-woolled and short-woolled classes of sheep. The Lincoln, the Leicester, and the Cotswold breeds are considered good types of the former; and the Down, the Welsh, and the Shetland breeds, of the latter.

The following brief notice of the characteristic properties of the various native wools, is founded upon the description given of them in the Jury Report of the International Exhibition of 1862, Class IV.

Of the "long wools," the *Lincoln* has greatly risen in value of late years. It is coarse, of great length, and silky in appearance, so that it is well adapted for "lustre" goods, in imitation of alpaca fabrics. *Leicester* wool is highly esteemed for combing. It is rather finer in the hair, but not usually so soft and silky in the staple as the last. *Cotswold* wool is similar to the Leicester, but somewhat harsher. It is not suited for lustre goods. *Highland* wool is long stapled, and of coarse quality, but known to be susceptible of great improvements. The practice of "smearing" greatly depreciates its value. It is

chiefly used for the coarsest kinds of woollen fabrics, as carpets, rugs, and similar articles. It is also used for Scotch blankets.

Of the "short wools," the different breeds of Downes partake very much of the same characters, but soil and climate so far affect them. The *South Down* is a short-stapled, small-haired wool, the longer qualities of which are put aside for combing purposes, and the shorter for the manufacture of light woollen goods, such as flannel. The *Hampshire Down* differs from it in being coarser, and in having the staple usually longer. The *Oxford Down*, again, exceeds the last in length and coarseness of staple. The *Norfolk Down*, on the other hand, when clean, is of a very fine and valuable character. The *Shropshire Down* is a breed increasing in importance, and is longer in the staple, and has more lustre than any of the other Down breeds. *Ryeland* wool is fine and short, but the breed is nearly extinct. The *Welsh* and *Shetland* wools have a hair-like texture, deficient in the spiral form, upon which depends the relative value of high-class wools. They are only suited for goods where the properties of shrinking and felting are not required. Shetland wool is obtained of various natural tints, which enables it to be used for producing different patterns without dyeing.

Of the intermediate wools, *Dorset* is clean, soft, and rather longer, and not quite so fine in the staple as the Down breeds. The *Cheriot* has increased very much of late years in public estimation. It is a small, fine-haired wool, of medium length, and is suitable for woollen and worsted purposes, for which it is largely used.

Some of the British colonies are very important wool-producing countries, Australia in this respect standing far in advance of all other countries whatever. The Australian wool has in general a beautiful, short, silky staple, well adapted for the manufacture of soft, pliable, and elastic fabrics. All the settled districts of this continent have been found well adapted to the growth of fine-woolled sheep, and the extraordinary increase in the flocks forms one of the most remarkable features of the colony. The breed has sprung from three merino rams and five ewes taken out by Captain M'Arthur in 1797. The alpaca wool grown in Australia since the creature was introduced some years ago is of inferior quality; but this is supposed to have arisen from rearing the animals too near the coast, and hopes are now entertained of succeeding better with it inland.

The wool of Cape Colony has of late years been greatly improved by the introduction of merinos, and, as will be seen from the table below, the exports from it are increasing very rapidly.

Among the imports from India, wool has of late become an important article, the quantity having risen from about 2,500,000 lbs. in 1840, to 21,000,000 lbs. in 1871; but the supply is rather fluctuating. A great deal of the Indian wool is coarse and hairy, and can only be used for low-class goods. We may state here that the most costly of all wools is obtained from the Tibetan goat, and is found next the skin, under the thick hair of the animal. From it, the far-famed Cashmere shawls are made. The highest price of any quality which is sold is from 6s. 10 7s. per lb. in the native markets, but the Maharajah of Cashmere keeps a strict monopoly over the best kind.

Turning now to European countries, it is somewhat sad to think that Spain, the native country of the merino, which not long ago sent all the wool for the best English cloths, has allowed its quality to degenerate, and its once large supply to dwindle away. The wool of Saxony, Silesia, and some parts of Austria, which is obtained from sheep of the merino breed, is the finest produced in any country; and notwithstanding the lower price and nearly equal quality of the Australian, German wool is still employed for the finest broadcloths, some kinds of ladies' shawls, and a few other purposes. Great attention is paid to the breeding and rearing of sheep in Germany, and large flocks are reared for their wool alone. In Austria, the number of sheep is estimated at 45,000,000, and the annual yield of wool at 100,000,000 lbs., most of it being of fine quality, and all of which is consumed in Austrian manufactures. France produces a large quantity both of fine and coarse wool. In Italy, the production of wool from mixed merino breeds has become a source of great wealth. Russia, as might be expected from its great extent, rears many qualities, from the finest merino to a very coarse kind. The wools of the remaining countries of Europe are of minor importance.

To get the total imports for each year, we would require to add the amounts from

countries of lesser importance, which are not given; but in the annexed statement we give the total annual imports for the three years 1872, 1873, 1874: (1872) 302,500, - 925; (1873) 313,496,742; (1874) 340,288,082. For several years past, about one-third of the imported wool has been re-exported. The estimated produce of home-grown wool in 1871 and the three preceding years was as follows:

	lbs.
1871. Total of Animals slaughtered, 12,370,056, estimated at	
23½ lbs. each	34,017,654
1871. Net Clip of Wool	144,935,712
1870. " " "	149,516,679
1869. " " "	153,591,096
1868. " " "	165,549,735

Independently of the vast amount of home and foreign grown wool which finds its way into our markets as wool that is in the condition fit for spinning and weaving, considerable quantities are retained on the skins, and made into rugs or mats for house and carriage use. For this purpose, skins of the very best quality are chosen, and it is necessary that the wool should be very long in the staple. After being carefully carried, the long silky locks of wool are dyed usually some bright color, and combed. The skins are pared to shape, and form handsome rugs, which are not only in great favor in Britain, but are extensively imported. The chief seat of this trade is at Bermoudey, in London, but it is also carried on to a considerable extent in other parts of the kingdom. Large numbers of Astracan sheep and lamb skins, usually black, are also imported in the wool, and are dressed and used as furs, that is, for personal wear; and some of the Shuk lambs' skins for this purpose fetch high prices.

We must not omit to mention that the wools of South America are now attaining great importance, as will be seen by the table below, but it is necessary to state that besides the 10,710,246 lbs. imported in 1877, there were 8,579,245 lbs. of alpaca (including llama and vicuña) wool. See ALPACA. The wool of the alpaca is very fine, from 6 to 12 inches long, of various colors, and well suited for certain kinds of goods, which are noticed under WOOLLEN and WORSTED MANUFACTURES. South American sheep's wool is of an inferior quality.

Much finer wool would be produced in Britain than is at present, if it were not that the demand for mutton, and the unfitness of the merino sheep for supplying that article of good quality, lead our farmers to choose breeds which are *primarily* mutton-producing.

The following table will shew at a glance the remarkable changes which have taken place in the sources from which Great Britain has derived its supplies of wool, and has the steady increase in the aggregate quantity imported:

IMPORTS OF WOOL FROM THE PRINCIPAL COUNTRIES.

Year.	Spain.	Germany.	Australia.	South Africa.	East Indies.	South America.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1810.....	5,952,407	778,837	167	....	....	Insignificant previous to 1833.
1815.....	2,938,607	2,816,657	18,611	9,623	....
1820.....	3,536,229	5,113,441	99,415	29,717	....
1830.....	1,643,515	26,078,882	1,967,279	33,407	....
1834.....	2,348,915	22,634,615	3,558,091	141,707	67,763	
1840.....	1,266,905	21,812,099	9,721,243	751,741	2,441,870	4,378,274
1850.....	440,751	9,166,731	39,018,221	5,709,529	3,478,262	5,296,648
1860.....	1,001,000	9,292,000	59,166,000	16,574,000	20,214,000	8,950,000
1870.....	25,262	4,912,000	175,081,427	32,785,271	11,143,148	12,457,631
1874.....	100,178	7,153,819	225,389,631	42,232,672	19,116,772	10,562,874

With respect to the wool, or woolly hair, of animals other than the sheep, which we have not already mentioned, the only one of much importance is moh-air, or the wool of the Angora Goat (q. v.). Of this material, there were about 7,000,000 lbs.

imported in 1874. It is a white silky wool, with an average length of staple of from 5 to 6 inches. The demand for it is only of recent origin, and, as will be noticed in our next article, it is chiefly used for certain kinds of ladies' dresses. The hair of camels, bullocks, common goats, and several furs are also used to some extent for manufacturing purposes.

The grand total of wool, shoddy, and goats' hair employed in the woollen industries of Great Britain in 1878, cannot have been far short of 500,000,000 lbs. The total import of raw cotton in 1877 was over 1,335,000,000 lbs.; but of this, nearly 1,512,500 lbs. were re-exported.

WOOLLEN AND WORSTED MANUFACTURES. The spinning and weaving of wool was practised from an early period in Asia Minor, Greece, Italy, and some other countries. It is very probable that the first lessons which our ancestors received in this art were got from the Romans after the Conquest: but the origin of the manufacture as a great staple is generally supposed to date from the time of William the Conqueror, when some Flemish weavers came to England, and obtained the patronage of the queen. The trade, however, fell off during the troubles of succeeding reigns. In 1331, it revived again by another supply of Dutch weavers brought over by Edward III. In 1530, the introduction of the spinning-wheel gave a new impetus to the trade. French workmen, driven to England by the revocation of the Edict of Nantes in 1685, still further aided it by their skill in the making of fine cloth, and from that time to the present it has steadily prospered. It is hardly necessary to state that the woollen trade has shared, in common with other leading textile manufactures, the great advancement they have received from the spinning-jenny, the mule, and the powerloom.

There are two great classes of manufacturers using wool as a raw material; in the one where carded wool is employed, the goods are called "woollen fabrics;" in the other, where combed wool is used, the goods are called "worsted fabric." We shall first treat of the *Woollen Manufacture*.

As our articles on **SPINNING** and **WEAVING** are general, we shall here briefly state the chief stages in these processes, as applied to the manufacture of woollen cloth. A fleece of wool is first sorted by experienced sorters into several qualities, as first sort, or "pick-locks;" second sort or quality; third sort or quality, and so on. Sometimes, it is only divided into three, sometimes into as many as six kinds. The "scouring" is the next step, and consists in immersing the wool in an alkaline lye, which forms a soap with the natural grease or the fleece. This of course acts as a detergent, and cleans the wool thoroughly when it is washed in water. Upon the perfection with which the scouring is performed, depends in great part the beauty of the dye. It is often dyed at this stage, and is then said to be *wool-dyed*; if not dyed till it is woven, the cloth is said to be *piece-dyed*. For some purposes it is dyed in the yarn.

Scoured wool, whether dyed or not, next undergoes the operation of "willing." The "willy" is a machine used to cleanse the wool from dust and other loose impurities. In many cases, seeds with hooked scales like burs are so thickly entangled in the wool that it requires to be passed through a "burring" machine, and afterwards examined by "pickers." This is especially the case with South American wool, including that of the alpaca. After this, the wool is sprinkled with olive oil, which renders the fibres soft, flexible, and better fitted for later operations. The next process consists in tearing open the matted portions and separating the wool into small tufts by means of a machine called a *teazer tucker*, or *devil*. It has a large cylinder studded over with iron picks, which performs from 1000 to 2000 revolutions per minute, teasing the wool as it revolves and throwing it out like flakes of snow.

The two next operations are called *scribbling* and *carding*, and are performed by two somewhat similar machines. Each machine consists of a large cylinder surrounded by several small rollers, all covered with wire-cards or brushes. These, acting like fine toothed combs, open out, mix and blend the fibres into a uniform and continuous sheet or lap, in which state it leaves the *scribbler*; but in the *carder*, the sheet is at length converted into small rolls, say from a quarter to half an inch in diameter, which are afterwards joined together, and form the basis of the thread. In the next machine, called the *stubbing-billy*, these rolls are drawn out, slightly twisted, and, in short, half converted into yarn.

The spindles upon which these *slubbs* or *slubbing* are wound pass them to the *spinning-mule*, where they are converted into finished yarn.

Comparatively recent improvements have made the operations of scribbling, carding, and slubbing continuous, mainly through the introduction of Apperly's patent feeder, and of a modification of the carding-machine called a *condenser*, which does away with the use of the slubbing-billy; so that what with the older machines is three separate processes, with the newer may be said to be only one. Each of the foregoing operations occasions a certain amount of "waste" wool, which is worked up again into inferior goods. It was, in fact, to such waste that the name *shoddy* was originally applied. In the spinning process, the warp yarns, having to bear the strain of the loom, are made in a different way from those for the weft, and they are besides hardened with size.

The difference between woollen and worsted fabrics is owing in great part to the way the yarn for each is spun. Yarn for woollen cloth is very slightly twisted, so as to leave the fibres as free as possible for the felting process; worsted yarn, on the contrary, is hard spun, and made into a much stronger thread. On account of the feebleness of woollen yarn, it is more difficult to weave it by power-looms than either worsted, cotton, linen, or silk.

Woollen cloth is now woven chiefly by power-looms. See **LOOM** and **WEAVING**. When the cloth is taken from the loom, it has a bare look, and is called the *raw thread*. It first requires to be *brayed* or *scoured*, to remove the oil added to the wool before spinning, and the size added to the warp. This is done by immersing it in some ammoniacal detergent liquid, such as urine and hog's dung, and squeezing it between rollers, or beating it in the fulling-stocks, and then rinsing it in clean water. The cloth then passes to the *burler*, who removes any knots or burls, and helps any imperfections. The next process to which it is subjected is the *milling* or *fulling*, and it is a very important one. In some mills, this is still done by beating the cloth in the *fulling-stocks*, which are heavy wooden mallets, raised by wheels with projecting canes; but a newer *fulling-machine* has come into use, in which the cloth is felted by passing it in a confined space between heavy rollers. With either machine, a thick solution of soap is used, and in the fulling-stocks an ordinary broadcloth will take 60 hours to mill, but a considerably shorter time suffices in the fulling-machine. The result of the operation is, that the fibres of wool become so interlocked—so thoroughly felted—as to leave no appearance of thread. The shrinkage of the cloth in the milling is sometimes nearly a half in the width, and about a fourth in the length. Another scouring follows the milling, and after that the nap or pile of the cloth is *raised* by Tensels (q. v.). These curious thistle-like heads are set in frames, which are arranged upon a large cylinder—the whole apparatus being called a *gig-mill*. As the cylinder revolves, the spines of the tensels raise the nap, which is afterwards cut by a process termed *shearing*. For this purpose, a cutting-machine with spiral blades arranged round an iron cylinder is used; and when it revolves, the spiral cutters, acting against a straight steel blade, shear off the nap of the fabric like scissors. The cloth is then boiled, or "scalded," to impart a lustre to it, and to prevent spotting with rain. After this it is dyed (if this is not previously done in the wool, and finally it is pressed between polished iron plates in a powerful hydraulic press. With respect to the dyeing of black cloth, it may be as well to explain that the term *woaded colors*, so commonly used in the trade, originally meant that Woad (q. v.) was used in conjunction with indigo as the basis of the color—a combination which produces the best and most durable color. Of late years, however, the name has been applied to the color of the fabric when indigo itself has been used as its basis. It is only the finest cloths that are now dyed in either of these ways—logwood, a salt of iron, and galls being much more generally employed to produce a black.

Names are given to various kinds of woollen cloths according to the style in which they are finished, the special material of which they are made, and the purpose for which they are intended. *Broadcloths* are classed into "superfines," running from 54 to 62 inches wide; "mediums," from 54 to 53 inches; "double milled," from 54 to 56 inches; and Venetians, which are twilled fabrics, from 54 to 53 inches. The general term broadcloth also includes the following varieties, which, for the most part, have less highly-finished surfaces—viz. meltons, beavers, pilots, clonkings, china striped cloths, India cloths, elastics, lustrés, and union cloths which have

cotton warps and woollen wefts. *Narrow cloths*, which average about 27 inches wide, include cassimeres, a thin, fine twilled fabric; doeskin, also twilled, a strong smooth-finished, sometimes treble-milled cloth, now usually dyed black for trousersings; Tweeds (q. v.), which have very much taken the place of fancy doeskins; and several other varieties. Then there are special kinds both broad and narrow—such as army cloths, rifle cloth, police cloth, upholstery cloth, carriage cloth, coffin cloths, and many more. Flannels, blankets, and some kinds of shawls, are also included among woollen goods.

The public taste has changed very much of late years with respect to the finish of woollen cloths. Formerly, a firm, close, and hard fabric, with a highly-dressed or glossy surface, was in demand; now, a softer and more pliable finish, without gloss, is in favor. Foreign manufacturers think, however, that a soft, rich, elastic cloth is apt to lose in strength what it gains in appearance, and do not finish so highly as the English. The desire for fancy woollens is another marked feature of the taste of the present day, and compels manufacturers to expend considerable sums in the perpetration of designs and colors. It has also led to the enlargement of old, and the establishment of new art schools in both the woollen and worsted centres in Yorkshire.

Of all the changes, however, which the present generation has witnessed in this trade, the most remarkable is doubtless the production of cheap cloths by the use of shoddy; although cotton warps have also done much in the same direction. Prepared shoddy is obtained, for the most part, by tearing up woollen rags by a *scarf*, with ten or twelve thousand iron spikes upon it, revolving inside an iron cylinder. Shoddy now enters to a greater or less extent into the composition of all but the very finest woollen cloths. It began to be used about 60 years ago, but the prejudice against it is scarcely yet overcome. In spite of this feeling, it has become so necessary, that to stop the supply, would be to shut one-third of the woollen mills in the kingdom. The excellent finish now given to woollen cloths containing a large proportion of shoddy, and also cloths with cotton warps, is quite surprising; and, moreover, their cheapness has brought comfortable clothing within the reach of the humblest classes. Cloths with too large an amount of shoddy in them are easily torn; but if a judicious admixture of pure wool has been employed, they wear comparatively well. Formerly, the only use of woollen rags was to make stocks for wall-papers, for saddlers' stuffing, and some minor purposes—the greater part being used as manure.

In the British Islands, the various branches of the woollen manufacture are very extensively diffused. According to a factory return made in 1871, it was carried on in 23 counties of England, 12 of Wales, 27 of Scotland, and 16 of Ireland. The principal seat of the manufacture of superfine broad-cloth is the west of England—Gloucestershire and Wiltshire especially—where it has existed for centuries. But Yorkshire is the great seat of the woollen manufacture, if we take in all the kinds, Leeds and Huddersfield being the great centres. One-half of all the operatives in the woollen factories of the kingdom are employed in Yorkshire, and here, too, the trade has increased most rapidly, both in the last and in the present century, owing mainly, it is believed, to the success of the manufacturers in producing cheap goods. Blankets are made chiefly at Witney, in Oxfordshire; at Dunsbury, in Yorkshire; and some places in the south of Scotland. Halifax and the surrounding district is the chief centre for flannels, but they are also made largely in Wales. In Scotland, the woollen manufacture is a very extensive one, but it has, for the most part, been already described under *TWEEDS*.

The imports of woollen and worsted yarns (not distinguished in the returns) have increased from 1861 to 1874 as follows: In 1861, 1,577,000 lbs.; in 1874, 15,131,650 lbs. The value of woollen cloths imported in 1861 and 1870 were respectively £119,654 and £243,634. In the annexed table, the exports of woollen and worsted goods are given for 1872, 1873, and 1874, and shew the prosperous state of trade:

	1872.	1873.	1874.
Woollen and worsted yarns (lbs.).....	39,734,924	34,744,607	34,931,008
Woollen and worsted cloths, coatings, &c. (yards).....	335,703,913	321,518,525	301,466,767
Flannels, blankets, carpets, &c. (yards).....	26,880,023	24,368,413	25,798,899
Total value.....	£37,023,023	£23,977,755	£26,887,753

Although steadily advancing, yet the progress of the woollen manufacture has been less rapid and extensive than that of other textile fabrics, which is believed to be owing to its processes being more numerous and complex, to the greater variety of machines and of workpeople required, and to the high price of the raw material.

The following statistics of the woollen industry of the United Kingdom are for the year 1875 :

NUMBER AND EFFECTIVENESS OF WOOLLEN FACTORIES.

	Number of Factories.	Total Number of Spindles.	Total Number of Power-looms.
England and Wales—			
Factories employed in spinning.....	480	568,512	....
Factories employed in weaving.....	45	....	1,675
Factories employed in spinning and weaving.....	771	2,248,651	43,150
Factories not included in either of the above descriptions.....	187	....	....
Total.....	1483	2,812,063	45,025
Scotland—			
Factories employed in spinning.....	102	223,119	....
Factories employed in weaving.....	40	....	7,326
Factories employed in spinning and weaving.....	105	375,444	4,452
Factories not included in either of the above descriptions.....	10	....	....
Total.....	257	606,563	11,758
Ireland—			
Factories employed in spinning.....	35	10,780	....
Factories employed in weaving.....	....	....	....
Factories employed in spinning and weaving.....	25	30,076	307
Factories not included in either of the above descriptions.....	....	....	....
Total.....	60	40,856	307
Grand total of woollen factories.....	1900	3,459,482	57,090

NUMBER OF OPERATIVES EMPLOYED.

	England and Wales	Scotland.	Ireland.	Total.
Males—under 13.....	4,391	579	7	4,977
“ 13 to 18.....	10,726	2,770	194	13,690
“ above 18.....	39,002	8,467	551	48,050
Total.....	54,119	11,816	752	66,717
Females—under 13.....	2,841	446	2	3,289
“ above 13.....	48,411	15,466	722	64,599
Total.....	51,252	15,912	724	67,888
Total, Males and Females.....	105,371	27,728	1,506	134,605

This does not give a full idea of the vast number of persons to whom this great industry gives employment, but only those engaged in spinning and weaving. A very large number are occupied in sorting and stapling, and other operations before the wool goes to the mills and factories, and also in dyeing and scouring it, either as wool or as woollen yarn and cloth; and in many districts much work is done by hand-loom workers in their cottages. None of these come under the operations of the Factory Act, and are consequently omitted in the returns.

Worsted Manufacture.—Worsted yarn, as has been already said, is spun in a different way from woollen yarn. In the former, the fibres are arranged as parallel as possible; in the latter, they are crossed in every direction, so as to assist the felting or milling of the cloth. For worsted, the wool is first combed, which is still done by hand as well as by machinery. When done by hand, the wool-comber performs his work with a pair of combs, each containing two or three rows of steel teeth, which he uses in a heated state. The wool, after being previously oiled, is stuck on one comb, and the teeth of the other are then drawn through it, till the second comb transfers most of the wool to itself. The process is alternately repeated with each comb until the fibres are quite parallel. The dressed wool is then withdrawn, and is called the *top*; but there remains in the teeth of the comb some short wool, called the *noil*, which is sold to the woollen-cloth makers. In this first combing, the wool is in a heated state, and requires to be combed a second time at a lower temperature.

The introduction of machines for combing wool has formed quite an epoch in the worsted trade. Previous to 1846, all the machines invented for this purpose were imitations of the hand process, and had the defect of producing too much short and too little long wool. In that year Heilmann patented in England an ingenious machine, which was not, however, introduced till 1849. Lister's machine, introduced in 1851, was an improvement upon it; but the close resemblance led to a protracted litigation, which ended in the latter purchasing Heilmann's patent for £20,000. Most of the latter combing-machines are also patented, and descriptions of them will be found in the specifications of patents. We are not aware that a very decided preference has been given to any special one, and to describe them all, even in the briefest way, would lead us beyond our limits.

The remaining processes in worsted spinning closely resemble those for cotton, and are sufficiently described under **SPINNING**; but the following table, which merely enumerates the products of the various stages may not be uninteresting: 1. Fleece (Lincoln wool). 2. Combed "top." 3. Noils, or short wool. 4. Sliver from first drawing-frame. 5, 6, 7, 8, 9, and 10. Slubbings from second, third, fourth, fifth, sixth, and seventh drawing-frames. 11. Roving from roving-frame. 12. Yarn No. 24 for the fancy trade, 10-10 drams per 560 yards. 13. Yarn No. 36 for delaines, &c., 11-10 drams per 560 yards. 14. Yarn for Coburgs, &c., 6-4-10 drams per 560 yards. Alpaca and mohair are combed and spun in a similar way to the worsted yarns from sheep's wool.

Those cloths manufactured from worsted yarns which are signed, are of course woven by various kinds of looms (see **JACQUARD LOOM** and **LOOM**); plain kinds are woven in looms similar to those used for woollens. When worsted goods leave the loom, they require only a superficial dressing, and in this respect differ much from woollen cloths, which we have seen require elaborate finishing processes.

Worsted stuffs are usually classified according to the materials of which they are composed, viz.: 1. Fabrics composed entirely of wool. 2. Fabrics composed of wool and cotton. 3. Fabrics composed of wool and silk. 4. Fabrics composed of wool, silk, and cotton. 5. Fabrics composed of alpaca and mohair mixed with cotton or silk. The first of these classes includes the fabrics so well known under the name of "merinos," and so called because they were first made of Spanish wool: for the "double-twilled" kinds, the French still maintain their superiority; but for the "single-twilled," the Yorkshire makers are considered the best. This class also comprises shalloons, says, serges, lastings—all stout and heavy fabrics—besides durans, bunting, moreens, damasks, reps, Russells, camlets, and many others, both for dress and furniture. Mouseline de laine was, as its name implies, originally all wool, but it is now more generally mixed with cotton, and printed.

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The *second* class includes two fabrics, of which the consumption for female dresses has been immense—viz., Coburg and Orleans cloths, the former being twilled, and the latter plain. Many of the names used in the all-wool class are retained in this, with the addition of the word "union," as union merino, union shalloon, union damask, &c. Winceys, now so popular for ladies' winter dresses, on account of their warmth, are made of wool and cotton, from yarns of a heavier and coarser kind than those used for cloths like Coburgs. Winceys are largely made at Aberdeen, Perth, Glasgow, and other places in Scotland, as well as in Yorkshire.

The *third* class includes the rich Poplins (q. v.) and Tabinets (q. v.), made chiefly in Dublin, and giving employment there to about 1200 hands. Paramatta or Henrietta cloth, Canton cloth, and others, are made both of silk and wool, and cotton and wool. Some Coburgs, Orleans, Russells, and Damasks are likewise made with silk warps.

The *fourth* class—viz., mixed goods, in which silk, wool, cotton, and sometimes linen are used—includes peculiar kinds of some of the fabrics named above, and also vestings, linings, cravats, scarfs, quiltings, boot and shoe cloths, barèges, &c.

The *fifth* class includes alpaca lustres and mixtures—plain, twilled, and figured; alpaca poplins, umbrella and parasol cloth; mohair lustres, glacés, Verona serges, barèges, &c.

Like the woollen, some of the statistics of the worsted manufacture are not more recent than 1871, to which year the following tables apply :

NUMBER AND EFFECTIVENESS OF WORSTED FACTORIES.

Divisions.	Number of Factories.	Number of Spindles.	Number of Power-looms.
England and Wales—			
Yorkshire.....	533	1,832,475	56,093
Other counties.....	61	176,401	7,161
Total.....	599	2,053,876	63,243
Scotland.....	23	71,556	1,201
Ireland.....	3	1,020	10
Total—United Kingdom.	630	2,131,452	64,454

NUMBER OF OPERATIVES EMPLOYED.

	England and Wales.	Scotland.	Ireland.	United Kingdom.
Males—under 13.....	8,631	21	....	8,652
“ 13 to 18.....	8,937	2,439	6	11,433
“ above 18.....	22,841	6,053	24	28,920
Total.....	40,409	8,515	30	49,004
Females—under 13.....	9,603	40	....	9,643
“ above 13.....	53,447	14,445	45	67,937
Total.....	63,055	14,485	45	77,585
Total.....	103,514	23,000	75	126,589

The same remarks apply here as in the case of the return of persons employed in the woollen manufactures, given under that head, and with still greater force, for there are a very great number of small traders connected with the worsted manufacture. As the numbers at bottom of page 463 shew, the imports of both worsted and woollen yarns have greatly increased of late years, and is no doubt greatly owing to the ingenuity of the Belgians in spinning good yarns from cheap wools, Belgium being the country from which by far the greater portion comes. In 1877, woollen and worsted cloths to the value of about £5,236,000 were imported.

With respect to the exports, the following will shew the increase which has taken place from 1860 to 1874 : 1860—Worsted yarn, 26,455,000 lbs. (£3,578,000); worsted stuffs, 148,685,000 yards (£7,013,000). 1865—Worsted yarn, 80,221,000 lbs. (£5,074,000); worsted stuffs, 233,078,000 yards (£13,361,000). 1874—Worsted yarn, 34,263,916 lbs. (£5,472,612); worsted stuffs, 261,185,081 yards (£11,698,072). In 1877, the exports had seriously declined—worsted yarn, 26,972,536 lbs. (£3,609,456); worsted stuffs, 194,777,084 yards (£7,725,414).

The rapid increase of the worsted manufacture as compared with the woollen, is no doubt to be ascribed to the greater simplicity of the processes, to the recent introduction of combing-machines, but most of all to the introduction of cotton-warps in 1835, which not only cheapened the goods, but vastly increased their variety.

The term "worsted" is said to have derived its origin from a village of that name in Norfolk, where the manufacture was first carried on. Up to the end of the last century, worsted goods were a staple-trade of Norwich; but the neglect of the factory system there led to its being transferred to Bradford, which has become renowned as the metropolis of the worsted manufacture. It is also extensively carried on at Halifax and other places in Yorkshire.

Information regarding such special branches of the woollen and worsted industries as carpets, shawls, hosiery, tartans, bonnets, &c. will be found under their separate heads. We may state here that the Scotch bonnet-trade, carried on at Kilmarnock and Stewarton, employs from 2000 to 3000 hands, and sends out about 500,000 bonnets daily.

WOOLLETT, William, one of the most eminent of English engravers, was born in the year 1735 at Maidstone. He went early to London; studied his art under a practitioner of the name of Tinney, now only remembered as having taught him little or nothing; taught himself, however, a good deal, notwithstanding the aid of Tinney, and developing a manner of his own, soon became known as one of the most accomplished engravers of his time. In recognition of his merit, he was ere long appointed engraver to George III. As to his life, except as he is proved to have existed by his works, familiar at this day to every one, nothing is known. He died in London, in the year 1785, after a life of continuous and conscientious labor, as reward of which, a monument was erected to him in Westminster Abbey. His works, more especially in landscape, continue to be much prized by connoisseurs.

WOOLSACK, the name given to the seat of the Lord Chancellor of England in the House of Lords, which is composed of a large square bag of wool without either back or arms, and covered with red cloth. The woolsack was first introduced in the House of Lords as the Chancellor's seat in the time of Elizabeth, as a memento of an act which was passed against the exportation of wool, that commodity being then the main source of the national wealth of England.

WOOLSTON, Thomas, a heterodox divine of the English Church, equally remarkable for ingenuity and learning, and for the singularity of his opinions, was born at Northampton in 1669. He was educated at Sidney Sussex College, Cambridge; was elected a Fellow of his college; entered into holy orders, and in due course proceeded to the degree of Bachelor of Divinity. Gifted with a lively fancy, he became a diligent and appreciative student of the works of Origen, and by them seems to have been first imbued with a taste for the allegorical interpretation of the Scriptures. That he was disposed to carry this principle of interpretation much too far for his contemporaries, appeared at once from his first work, published in 1706. This was, "The Old Apology for the Truth of the Christian Religion against the Jews and Gentiles revived." In this work, W. maintained that Moses was only an

allegorical person, and all his history typical of that of Christ; that the miracles of the Pentateuch were allegorical, and the miracles attributed to Christ and the apostles pure allegory too; and he stigmatised as atheists and apostates all who received the Scripture narratives as literally, historically true. In subsequent publications, he went further in the same direction; also maintaining that the Quakers approached more nearly in doctrine and organisation to the primitive church than any other religious body; and denouncing clergymen, because they made a profession of the pastorate, as "hireling priests," worshippers of the Beast, and ministers of Antichrist. In 1721, he published "The Moderator between the Infidel and the Apostate," dialogues tending to shew that the gospel miracles, by themselves, could not prove Christ to be the Messiah. This work occasioned great scandal: it abounded in expressions considered indecent and blasphemous; and it was only through the intervention of Whiston, who was friendly to him, and in favor of toleration in matters of opinion, that the author escaped a prosecution. Up to 1720, W. had continued to live in his college, leading a studious and blameless life, and shewing great kindness to the poor. In 1720, he went to live in London; and in 1721, his college, upon some pretext—really on account of the scandal made by his writings—deprived him of his Fellowship. The views set forth in the last-mentioned work, W. developed more fully in a series of six discourses during the years 1727, 1728, 1729, republished under the title "Discourses on the Miracles of Christ." He maintained—representing himself, as in all his works, as the defender of true Christian doctrine—that Christ's miracles, in themselves, were open to the gravest doubts; that, in fact, the gospel narratives, if they were to be taken literally, were only a tissue of absurdities; and that the authority of the ancient church was against the literal, and in favor of an allegorical acceptance of them. These views were supported with a good deal of warmth, and mixed up with them were fierce denunciations of the order of clergy. The free-thinkers, both in England and on the continent, were now triumphantly quoting W. in their favor; and people who had previously been disposed to treat him as a maniac, whose rhapsodies were too wild to call for refutation, began to think it time to rescue the Christian faith from so dangerous and dubious a defender. No less than sixty answers were made to the "Discourses." Now, too—Whiston no longer intervening—an indictment, at the instance of the Attorney-general, was brought against W., on account of the blasphemous and irreligious character attributed to his works. He was tried before Chief-justice Raymond at Guildhall, found guilty, and sentenced to be imprisoned for a year, and to pay a fine of £100, and ordered to find securities to the amount of £2000 that he would not repeat his offence. He was imprisoned in the Queen's Bench Prison; and being unable to pay the fine, and both unable and unwilling to provide the requisite securities, the remainder of his life was spent within the rules of the prison. It was not long protracted. He died on the 27th January 1731. His death-bed scene has often been described as if it supported the supposition that W. was insane, but surely without good reason. It is stated that as he felt death approaching, he closed his eyes with his own fingers, saying to the turnkey who attended him, that he desired to die decently; and his last words were: "This is a struggle which all men must go through, and which I bear not only patiently, but willingly." His body was interred in the churchyard of St. George's, Southwark.

WOOLWICH, a market-town and parish of Kent, the seat of the chief government arsenal of Great Britain, stands on the south bank of the Thames, about nine miles east of London. It stretches along the bank of the river for two miles, and reaches back from the river for half-a-mile, as far as the brow of the hill, where are the Royal Artillery Barracks and Hospital. The general appearance of the town has little to recommend it; but the southern suburbs are handsome and regular. There are numerous places of worship—established, Roman Catholic, and dissenting, and there are numerous schools, a theatre, &c. Its dockyard, its government manufacturing establishments for the production of material of war of every description (except gunpowder), and the fact that it is a great dépôt for naval and military stores, and also the headquarters of the great corps of Royal Artillery, combine to render W. a place of great importance. A royal dockyard existed here as early as 1516, and the *Henry Grace de Dieu*, which conveyed Henry VIII. to the Field of the Cloth of Gold, is said to have been built here, though this statement has been disputed. The *Royal George* (q. v.) was built here in 1761. The royal dockyard and ship-building

establishment was, however, closed on the 1st October 1869. The yard comprised large dry docks, and a basin 400 feet long by 800 feet wide, and was furnished in every respect with the newest and most efficient apparatus. The Royal Arsenal, the largest in Britain, contains not only the largest stores of all kinds—shot, shells, cannon, &c.—which are required for our armies, navies, and forts, but it comprises also establishments for manufacturing them, and for constructing gun-carriages, and preparing ammunition for cannon and small arms. These works are carried on in the three departments called respectively the Gun Factories, Carriage Department, and Laboratory. On the common, south of the town, is the Royal Military Academy, for the education of cadets destined for the Artillery and Engineers, Pop. of parish (1871), 35,567.

WOONSOCKET, a township of Rhode Island, U. S., on both sides of the Blackstone River, 16 miles north-by-west of Providence, on Providence and Worcester Railway, containing a central and several smaller villages, numerous cotton-mills, woollen-mills, machine-shops, iron-foundries, sash, blind, and planing mills, factories of thread, silk, gold pencil-cases, jewellery, musical instruments, tin-ware, marble works, 7 churches, high school, and two newspapers. Pop. (1870) 11,527; (1880) 16,050.

WOORALI POISON. Since the original publication of the article **CURARI**, which is one of the synonyms of this substance, the physiological action of this fearful poison has been carefully studied by Drs Weir, Mitchell, and Hammond, of the United States; and the Essay in which their joint labors are recorded is published in Hammond's "Physiological Memoirs" (1863). This Essay is so valuable, and contains so much original matter regarding two other allied poisons whose native names are *Corroval* and *Pao*, that we shall give a brief abstract of its contents; premising that, for the best account of the history of this remarkable poison, the reader should consult Bernard's "*Leçons sur les Effets des Substances Toxiques*" (1857, p. 228). We shall notice the physical and chemical properties of this poison before describing its physiological action. The best of the earlier investigations of the poison is that of Roulin and Boussingault in 1828, who obtained from the crude "woorala" an alcoholic extract, to which they gave the name of *curarin*. This curarin was a solid transparent mass, of an excessively bitter taste, and possessed in an eminent degree of all the virulence of the woorall. Heintz has subsequently examined the precipitate which tannic acid throws down from the watery solution of the poison, but only found that it contained no nitrogen, and was composed of apparently inert substances, as sugar, gum, resin, extractive matter, tannic and gallic acids, &c. He sought in vain for strychnine in it. Amongst the chief experimenters on the subject may be mentioned De la Condamine ("Mém. de l'Académie des Sciences," 1745, t. 67, p. 391); Brocklesby ("Philosophical Transactions," 1747, vol. xlv. p. 408); Herissant ("Philosophical Transactions," 1751—1752, vol. xlvii. p. 75), who killed a bear with a poisoned arrow in less than five minutes; and nearly killed himself and a small boy who was evaporating an aqueous solution of the poison: both, however, recovered under the influence of fresh air, a pint of wine, and a quantity of sugar; Fontana (1781), who shewed that (notwithstanding the above experiment) the vapor is not deleterious, and that the state of the stomach at the time when the poison was inhaled modified the result, an animal with a full stomach being able to resist the action of a dose that would prove fatal to one of the same size when fasting; Brodie ("Philosophical Transactions," 1811—1812); Virchow and Münter (published in vol. I. of Schomburgk's "*Reisen in Britisch-Guiana*,") who, *inter alia*, shewed that the poison, even after being kept dry for five years, is still intensely active—that its physiological action corresponds with the result of analysis in shewing the absence of strychnine, and that it rather belongs to narcotic than to tetanic poisons—and that death takes place not from any direct result of the poison, but indirectly, causing the cessation of the respiratory process; Bernard and Pelouze ("Compt. Rend.," 1850, t. xxxi. p. 534); Vulpian ("Compt. Rend.," 1854, t. I., 2d series, p. 73); and Kölliker ("Proceedings of the Royal Society," 1857), who amongst other important conclusions, arrived at the following: (1) That the *urari* (as he terms it) causes death very rapidly when injected into the blood or inserted into a wound; and that when introduced by way of the mucous membrane, its effects are slow and require a large dose for their production; when applied to the skin of frogs, it is inoperative; (2) it acts through the blood, and

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destroys the excitability of the motor nerves, while the sensory nerves are hardly at all affected; (3) when artificial respiration is carried on in animals under its influence, many of the secretions are increased, owing to the paralysis of the vascular nerves, and the consequent dilatation of the vessels; (4) that in mammals, the poison causes death by the paralysis of the respiratory nerves and suppression of the respiration, which brings on convulsions as a collateral effect.

The late researches of Weir, Mitchell, and Hammond, on the two hitherto undescribed varieties of the poison, named *Woorara*, var. *Corroval*, and *Woorara*, var. *Vao*, lead to the following results. The corroval, which is asserted to be the strongest arrow-poison, but of whose mode of manufacture they could learn nothing, was in large lumps of a brownish black color, resembling vegetable extracts of that tint. From its aqueous solution they obtained a substance possessing all the qualities of an alkaloid, and in an eminent degree the poisonous properties of the corroval, to which they assign the name *Corrovalia*. Hence it differs materially in its chemical composition from ordinary woorali. From a large number of experiments on living birds, mice, cats, frogs, and alligators, they find (1) that corroval differs essentially from any variety of woorali hitherto described in its physiological results; (2) that it acts primarily on the heart through the medium of the blood, producing an arrest of the heart's action; (3) that the annihilation of voluntary and reflex movements is a secondary result of its action, depending primarily on the cessation of the heart's action; (4) that it acts upon the nerves from the surface to the centre, and abolishes both the sensory and motor functions; (5) that it destroys muscular irritability; (6) that it paralyzes the sympathetic nerve, this being one of its primary effects; (7) that it is absorbed both from the intestinal canal and skin of frogs; and (8) that its poisonous effects are due to an alkaloid hitherto undescribed. The authors devote 42 pages to a history of their experiments on *Vao* or *Bao*; but as they are of opinion that *vao* is only a weaker variety of corroval, it is unnecessary to follow their researches in this direction. It is obvious that in corroval and *vao* we have a fearful poison, quite distinct from ordinary woorali; and we have entered into further detail on this subject than we should otherwise have done, because, so far as we know, they have not yet been noticed by any English author.

WOOTZ is a finely damasked hard cast steel, which is obtained from India. Faraday found aluminium in a sample which he analysed, and referred its peculiar properties to the presence of this metal; but other chemists have failed in finding aluminium in Wootz.

WORCESTERSHIRE, one of the west-midland counties of England. The conterminous counties are those of Warwick and Stafford on the n., Warwick and Oxford on the e., Gloucester on the s., and Hereford and Salop on the w. Area, 472,458 acres, whereof about 400,000 are cultivated. Its greatest length is 83 miles, and greatest breadth, 26. The surface is undulating, and there are depressed valleys and hilly ranges; two of the latter are of considerable extent, and adorn its eastern and western sides. On the west, the range terminates in the Malvern Hills, one of the highest points of which is the Worcestershire Beacon, about 1100 feet above the level of the sea. Its name is derived from its shape, a cone towering beacon-like above the lesser eminences of the chain; but the highest peak of the range is named the Herefordshire Beacon, which stands within the county of Hereford. The eastern range is the Breton Hills, which form part of a chain extending from Bromsgrove Lickey, near Birmingham, to the Cotswold Hills, near Gloucester. The county is well watered, and finely timbered, especially with fruit-trees. The elm grows very luxuriantly, and indeed is so common in every corner as to have obtained the name of "the weed of Worcestershire." The oak, beech, and other timber trees thrive well, and of late the larch has been much planted. The principal rivers are the Severn, the Teme, and the Avon. Other streams there are, such as the Stour, the Salwarp, &c., but except in flood-times, these are mere brooks, and scarcely deserve the name of river. The Severn is navigable for vessel of 80 tons as high as Worcester, and for those of 60 tons to Stourport, 14 miles farther; and smaller boats can reach Shrewsbury, the river being navigable for 180 miles. There are three canals communicating with the Severn—viz., the Staffordshire and Worcestershire at Stourport; the Droitwich, a little way above Worcester; and the Birmingham and Worcester, in the immediate neighborhood of

the city. The w. portion of the Vale of Severn is about 80 miles long; the climate is mild and healthy; but the rainfall is comparatively small, and nearly the minimum of England. There are mineral springs at Malvern, Evesham, Dudley, and Kidderminster. Nearly the whole of the country is on the red sandstone formation, but the Malvern and Lickey Hills are of igneous origin. The soil consists of almost every variety suitable for vegetation, from strong deep clay and rich vegetable mould, to light friable sandy rye-land, with tracts of alluvial deposit, marl, and loam. The Vale of Evesham is dependent on the Avon for its fertility, which has long gained for it the reputation of being the garden of the mid-west. It produces abundance of table-fruit, and vegetables of the finest quality. The agriculture of W. has been greatly improved during the last thirty years, and high-farming is now much in vogue. Excellent crops of wheat and other grains, turnips, and potatoes are raised; a large portion of the land remains in the form of meadow, and much of it ancient pasture.

Hop-gardens are plentiful in the western division of the county, and their produce ranks, in the estimation of brewers, next to that of East Kent. W. is, *par excellence*, a perry county, as Herefordshire and Devonshire are cider counties. Its pear orchards are very beautiful in the time of blossom; and there is a splendid variety called the "black pear of Worcester," which attains a great size, and is supposed to be the traditional pear blazoned on the county's shield of arms.

There is no distinctive local breed of stock, either cattle or sheep. The cattle in most favor are Herefords and Shorthorns; and among sheep, the favorite varieties are Shropshire Down, Leicesters, Cotswolds, and cross-breeds. Pigs are abundantly bred and fed. The markets are well supplied with butcher-meat, bred and fed in the county; and London, Birmingham, and the "Black Country" draw large supplies from Worcestershire. Poultry are raised in considerable quantity, and the W. farmer's wives have deservedly obtained a good name for the condition and neatness in which they are sent to market. The county possesses great mineral wealth in coal, iron, salt, lime: the first three are found in the north-eastern quarter of W., but lime is very generally distributed. Coal and iron mines are largely worked in the neighborhood of the populous borough of Dudley. Iron-works abound between it and Stourbridge, where glass manufactures of an ornamental character, on a large scale, have taken root; and there are abundance of coal-mines in the neighborhood. Quarries of limestones are largely wrought near Evesham and Pershore.

The textile fabric manufactures are nearly confined to carpet-weaving, which has long been carried on successfully at Kidderminster; but the town has almost ceased to produce that description of goods known by its name, "Brussels" and "tapestry" being principally manufactured. At and in the neighborhood of Worcester a considerable number of persons are engaged in glove-making. W. china, which has gained a world-wide reputation, is also produced upon a large scale in the capital city. At Redditch, the needle and fish-hook manufacture is carried on to a greater extent than in any other place in England; nail-making has been practised for centuries at Bromsgrove; and at Droitwich, about six miles from Worcester, salt has been manufactured for many centuries from an inexhaustible supply of brine. Pop. (1871) 338,837, of whom about 200,000 are connected with mines and manufactures, and the remainder are engaged in agriculture, or dependent on trade. The county is in the Oxford circuit, and in the district of the Birmingham court of bankruptcy. W. possesses a county regiment of militia, consisting of 850 officers and privates; also the Queen's Own Regiment of Worcestershire Yeomanry Cavalry, 700 sabres; and the Worcestershire Regiment of Rifle Volunteers, comprising two battalions, each about 800 strong. The county sends four knights of the shire to parliament, and six members for the boroughs of Evesham, Kidderminster, Droitwich, Dudley (one half of which is in Staffordshire), Bewdley (and Stourport united), besides two for the city—making a total of twelve members from Worcestershire.

W^{ORCESTER}, a city, capital and assize town of the county of the same name, and a county of itself, stands almost in the centre of the Severn Valley, and is situated principally on the eastern bank of the river, about 26 miles south-west from Birmingham. W. is of great antiquity; there are abundant traces of ancient iron-smelting works on the banks of the river, adjudged by antiquaries to belong to the times of the Roman occupation; and the frequent discovery of other remains proves that the city was a Roman station. The chief object of antiquity now existing is the

cathedral, which is beautifully placed on a gentle elevation on the east bank of the river, and stands within its own precinct, but which, since the passing of the act abolishing the isolation of "peculiars" and "non-parochial places," has been incorporated in the city parish of St Michael. A cathedral, dedicated to St Peter, was founded here as early as the 7th c. In 1004, Bishop Wulstan laid the foundation of a new cathedral, many portions of which remain in the present structure, such as the crypt (one of the oldest and most interesting in England), the bases of and fragments in many of the walls, chapter-house, refectory, and cloisters. In the Civil Wars, much damage was done to the building, but none of its leading features were destroyed. It is now distinguished by the simplicity, if not plainness, of the exterior, but which is amply compensated by the fine perspective, the lofty roof, and generally charming effect of the interior. A thorough restoration, now practically completed, was commenced some years ago, and the works have cost nearly £60,000. The tombs of King John, and of Arthur, Prince of Wales (eldest son of Henry VII.), are the chief ancient monuments in the building. The Episcopal Palace in the city has been transformed into the Deanery; and the bishop of W., since the ecclesiastical commissioners assumed the management of the episcopal and capitular estates, has his residence at Hertlebury Castle. The bishop of W.'s revenue has been fixed by the ecclesiastical commissioners at £5000; and the livings in his gift are numerous and of considerable value. Worcester chapter consists of the dean, 4 canons, 25 honorary canons, and 4 minor canons, including the precentor. Besides 10 chorister boys, there are 40 other boys on the foundation at the College or Cathedral School, who receive gratuitous education, and about 60 non-foundation boys. There is also a city Grammar School, founded by Queen Elizabeth, and largely attended. The parish churches of the city, eleven in number, are poor specimens of architecture. The city does not shine in public buildings. Next to the cathedral, the most important are the Shire Hall, the Guildhall, and the county prison; but there are also the city library, the W. Museum, a corn-exchange, and music-hall. The battle of W., fought in 1651, is memorable in history, and Charles II., to commemorate the fidelity of the citizens to his cause, granted the motto to the city arms: "*Civitas in bello et in pace fidelis.*" Pop. of the city (1871), 83,116. The people are employed in glove-making, including leather dressing and staining; in porcelain factories; iron works, including locomotive-engine factories; tanning and carrying, horse-hair weaving, vinegar, British wine and sauce making, and coach-building. Chemical manures and agricultural implements are also manufactured on a considerable scale. Glove-making is still considered the staple manufacture of the city; but one large factory has absorbed a large portion of the business, and now there are not above two dozen of master-glovers, great and little, whereas 40 years ago there were nearly 100 in the trade. There are two porcelain factories, and the number of hands employed by them in all departments is about 400. The Royal Porcelain Works are celebrated for fine taste in designing, and the beauty of execution of the highest class of productions; while the specialty of the other factory, Messrs Granger & Co.'s, is utility, combined with purity of design and excellence in workmanship. They are celebrated for their semi-porcelain, which is so excellently glazed as to resist the strongest acids. The city is one of the chief stations on the Midland (Birmingham to Bristol), and Great Western (London to Birkenhead) Railways, and there are also branches to Hereford, South Wales, &c. W. sends two members to parliament, and is governed by a corporation consisting of a mayor, 12 aldermen, and 36 councillors. It has also a recorder and sheriff.

WORCESTER, a city of Massachusetts, U. S., the centre of a fine agricultural district, 45 miles west-south-west of Boston, with several diverging railways, in a valley surrounded by beautiful hills, with delightful sites for residences, broad shaded streets, and famed for its political and philanthropical conventions. Among its institutions are, the American Antiquarian Society, with a library of 50,000 volumes, and cabinet; the State Lunatic Asylum, which, in 13 years, out of 2306 patients, discharged 1000 cured; Oread Institute, for young ladies; high grammar, intermediate, and primary schools, considered the model schools of New England; also, manufactories of cotton, woollen, carpets, hollow-ware, pistols, wire, paper, saddles, locks, musical instruments, &c. There are 80 churches, 12 periodicals, & daily. Pop. (1880) 52,291.

WORCESTER COLLEGE, Oxford, was founded, like Trinity and St John's, on the site of an old monastic college. The ancient institution was known by the name of Gloucester College, because it belonged to the Benedictine Monks of that city. After the dissolution of the monasteries, it passed through various hands; and latterly was a Hall attached to St John's College. In 1701, however, Sir Thomas Cookes left £10,000 for the purpose of endowing some existing College or Hall. This bequest led to the erection of Gloucester Hall into a College, for a provost, six fellows, and six scholars, by letters-patent of Queen Anne, 1714. Various fellowships and scholarships were afterwards added, until the number of fellows became 31, of scholars 16, but almost all restricted to certain counties, or to founders' kin. The Commissioners under 17 and 18 Vict. c. 81 reduced the number of fellowships to 15, open without restriction, except that candidates for a fellowship on the Eaton foundation must be sons of clergymen of the Church of England and Ireland and must not be possessed of property or income exceeding £150 a year. The scholarships are now 16 in number—six on the foundation of Sir Thomas Cookes for persons educated at Bromsgrove School; one on the foundation of Dr Finney, for natives of Staffordshire; five on the foundation of Mrs Sarah Eaton, for sons of clergymen of the Church of England; and three on the foundation of Dr Clarke, and one on the foundation of Robert Barnes, Esq., which are entirely open. Most of the scholarships are of the value of £75, tenable for five years. There are also seven exhibitions—four on the foundation of Sir Thomas Cookes, value £42 a year, for persons educated at Bromsgrove School. There are ten benefices in the gift of this College.

WORD, in time of peace, a signal notified in the orders of the day, in virtue of a knowledge of which a sentry will allow the utterer to pass. In the field, the officer commanding fixes daily upon a word and countersign (for which any arbitrary terms are taken), and communicates them to the sentries on guard, and to such other persons only as he may choose to permit to pass through the lines. Any person then approaching a sentry without knowing the *word*, has a fair chance of being shot; if he knows not the countersign, the sentry will take him into custody, and deliver him to the officer of the guard. Care has to be taken that the "word" should not suggest the "countersign." Any arbitrary combination is therefore adopted.

WORDSWORTH, William, a distinguished English poet, was born on the 7th April 1770, at Cockermouth, in Cumberland. He was the second son of John Wordsworth, attorney, and agent on the estates of the first Earl of Lonsdale. He was sent to school at Penrith, where his parents had gone to reside; and after the death of his mother in 1778, was transferred to Hawkshead, in Lancashire, at the public school of which his earlier education was completed. In 1788, his father died, leaving his family in some difficulty. By Lord Lonsdale, a considerable sum was due to them; but his Lordship, a man of most eccentric character, saw fit to resist the claim, with all the vexatious impediments which the law so plentifully affords. Enough, however, remained, with some little assistance from relatives, to carry forward the education of the children. W. remained at Hawkshead till 1787, in which year he was entered at St John's College, Cambridge. Here he remained four years. In the studies proper to the place, his interest was slight; but in his own fashion he was a diligent student; and poetry became more and more his favorite pursuit. In January 1791, he left Cambridge, after taking his degree as Bachelor. During the autumn of the previous year, he had, along with a fellow-student, made a pedestrian tour through France, then in the early fervors of its great revolution; and thither, after leaving college, he returned. His sympathy with the aims of the Revolution was passionate; and with the party of the Gironde he seems to have cultivated relations of a somewhat intimate kind, which, in the end, might have seriously compromised him, had not circumstances, probably of the pecuniary sort, determined his return to England some little time before his friends were sent in a body to the scaffold. The republican principles which at this time he held, he lived to renounce in favor of a reasoned conservatism; and opposed as he was, in its earlier stages, to the war waged against France, no one more patriotically urged it, when the struggle became in effect a life and death grapple on the part of England with the military despotism of Napoleon.

In 1793, W. came before the public as an author, in two poems, entitled "An Evening Walk, addressed to a Young Lady;" and "Descriptive Sketches, taken during a Pedestrian Tour among the Alps." These pieces abound in touches of refined and original observation of nature but otherwise are not in themselves specially remarkable; and they failed to make any impression, except on a few minds, such as that of Coleridge, then at Cambridge, who afterwards professed to have discerned in them the seeds of a great undeveloped genius. W. was now in a position of much perplexity; his little finances were almost entirely exhausted: for the church, which his friends would fain have had him enter, he had at this time an obstinate aversion; poetry had become with him a passion, to which he longed to wholly dedicate himself; and unhappily it appeared that his poetry would not in the least pay. As a poet cannot live like a singing-bird by pecking about the hedgerows, it became necessary for him to bethink himself of some means of support; and he was on the point of proceeding to London, to do liberal politics for the newspapers, when unexpected relief came to him in the shape of a legacy. The name of Ralsley Calvert deserves to be remembered with that of Wordsworth. An intimate friend of the poet, he had formed a high opinion of his genius; and at his early death in 1795, he was found to have bequeathed to W. the sum of £900, expressly that leisure might for some years be allowed for the undisturbed development of his powers. Seldom has money been better bestowed; and small as the sum may seem, to a man of the poet's simple tastes and entire singleness of aim, it could suffice over a term of years. With his only sister, Dorothy, his attached companion through life, and always a devout believer in the brother, no little of whose genius she shared, he now settled himself at Racedown Lodge, in Dorsetshire, removing in 1797 to Alfoxden, in Somersetshire, in order to be near Coleridge, who had established himself some three miles off at Nether-Stowey. Out of the intimacy thus begun, came the famous "Lyrical Ballads," published in 1798 by Cottle of Bristol, as a joint adventure of the two poets. The volume had no success; but probably no man ever lived more serenely self-appreciated than W.; and he did not allow himself to be disheartened by the neglect meantime of the world. After a short tour in Germany, along with his sister and friend, he returned to his native Cumberland, which he never again permanently left. He settled himself first at Grasmere; in 1803, he removed to Allan Bank, in the vicinity; and in 1813, he transferred his household to Rydal Mount, the place which, of all others, remains specially associated with his memory. On the death of the old Lord Lonsdale, the justice of the claim of the Wordsworths against the estates was admitted; and in 1802, a sum of about £8000 was by his successor made over to the family. To W. and his sister, their moiety of the money may have been acceptable, as by this time, one should say, they must needs have been seeing pretty high to the end of Ralsley Calvert's convenient £900. Henceforth, a modest competence was secure to them; and W. was wedded within the year to Mary Hutchinson, a cousin of his own, with whom he had been intimate from his childhood. In 1813, by the kindness of Lord Lonsdale, he was appointed Distributor of Stamps for the county of Westmoreland, a situation which brought him, without much to do for it, a salary of £500 a year. When, the year after, he published his great poem, "The Excursion," he dedicated it to Lord Lonsdale, in a sonnet, expressive of "high respect and gratitude sincere" for this comfortable increase to an income sufficient, perhaps, but certainly not excessive, for a man who had now a family growing up round him. Meantime, and pending the appearance of this elaborate work, the reputation of the poet had been surely, if slowly rising. In 1800, he had published, in 2 vols., a second edition of the "Lyrical Ballads," disjoining his own from those of Coleridge, and adding a quantity of new matter; and in 1802 and 1805, further editions had been issued. To these succeeded, in 1807, a new collection, under the title of "Poems, in Two Volumes." In these earlier writings, there was a good deal which almost wilfully seemed to invite ridicule; and for a good while, W. was merely the laughing-stock of reviewers, more particularly of Jeffrey, who, as editor of the great "Edinburgh," at this time figured as chief Aristarchus of the day. The more to popularise the ridicule, a nickname was invented; and "the Lake School," as it was called, which, with W., included Coleridge and Southey, who chanced to reside in the same district, passed current as an easy name of scorn. It could not be long concealed, however, that these volumes of W., despite an occasional eccentricity in the choice of mean and impracticable subjects, contained a large body of true poetry of

a singularly fresh and original kind. A select circle of passionate admirers, including men like Leigh Hunt, De Quincey, and Wilson, eagerly pressed the true claims of the poet; and after the publication of "The Excursion," a volume of high and serious verse, gravely defective in plan, and at times heavy and tedious, but with little or no trace in it of the earlier oddities of the writer, it came more and more to be felt that the laughers were getting the worst of it, and that W., however he might now and then indulge himself in whimsical tricks, was really a man of true and lofty genius, against whom ridicule could not permanently avail. Their occupation was not yet, indeed, quite gone; and the subsequent appearance, in 1819, of "Peter Bell," a poem not without profound merits, but unhappily with a donkey for the hero of it, allowed them to resume their advantage a little. But, on the whole, the day of idle jeer was over; the tide of genuine appreciation had set in, and it continued to flow steadily, till, long before his death, W. found himself recognised almost *nem. con.* as at the head of the poetical literature of his country. His later days were passed serenely in honor. In 1839, the university of Oxford conferred on him its honorary degree of D.C.L. In 1842, a pension of £300 per annum was assigned him by government; on receipt of which he ceded, in favor of his son, his situation as Distributor of Stamps; and on the death of his friend Southey, in 1843, he succeeded to the vacant laureateship. On the 23d April 1850, he peacefully closed a life so pure, serene, and priest-like in its consecration to a lofty purpose, that we must go back to Milton in order to find its parallel. It remains only to enumerate the publications of W. not included above. In 1815, appeared "The White Doe of Rylstone," which was followed by "The Waggoner," and a series of "Sonnets on the River Duddon." In 1822, he published a volume entitled "Memorials of a Tour on the Continent;" some years after, his "Ecclesiastical Sonnets;" and in 1835, "Yarrow Revisited, and Other Poems," the fruit of a tour to Scotland, memorable by his mournful parting, at Abbotsford, with the dying Scott, which he records in a beautiful sonnet. In 1842, he issued a collected edition of his works, rearranged as we now have them, in a somewhat fanciful fashion of his own. Shortly after his death, a long autobiographical poem, in blank verse, was published, entitled "The Prelude."

By remanding it to truth and simplicity of natural feeling as its basis, W. did more than perhaps any other writer of his time to forward the great revival of English poetry which distinguished the opening of the century. But he was scarcely the originator of the movement; the new influence was, so to speak, "in the air;" already Cowper in England, as in Scotland Burns, had preluded to the melodious outburst which was to follow; and to the last of these more particularly, as his early guide and exemplar, W. has expressly recorded his obligations in a stanza which, so far as we are aware, has hitherto escaped quotation:

"I mourned with thousands, but as one
More deeply grieved, for he was gone
Whose light I halled when first it shone,
And shewed my youth
How verse may build a princely throne
On humble truth."

With the charm of natural simplicity of manner, common to him with these his predecessors, W., however, combined a depth of philosophic meditation peculiarly his own; there was born with him, moreover, a passionate susceptibility to effects of beauty in the material world, such as few men can ever have been gifted with; and out of these blended elements arose that mystical communion with Nature which pervades the whole body of his poetry, and constitutes its truest claim to originality. By diffusion of this, and otherwise, his influence on our subsequent poetry has perhaps been as profound as any of the kind ever exercised, and it has been almost wholly beneficial. Yet we need not admire all we find in him. The early ridicule directed against him, though it stung by excess and disproportion, was really to a great extent deserved. Had he gone on writing nothing but the "Betty Foy's" and "Alice Fells" which Jeffrey laughed at, we should not have had in this place to do a biography of him. It is despite of a good deal of this kind of perverse drivel, besides indifferent matter otherwise, and not in the least because of it, that he continues, and must long continue, to be remembered.—See "Memoirs of William Wordsworth," by Christ. Wordsworth, D. D.

WORK. To do work is to overcome resistance. If we try to lift a ton-weight, however we may fatigue ourselves, we cannot move it, and therefore we do no work. But we can lift with ease a hundred-weight, and then we do more work in proportion as we raise it higher. In lifting coals from a pit, the work done is evidently in proportion to the depth of the pit, and to the weight of the coals raised. This and numberless other instances are too well known to need further description. We may therefore at once define the *work done by a force as the product of the force into the space through which it moves its point of application in its own direction*, and it is usually measured by engineers, and others who do not require absolute accuracy, in *foot-pounds*, the work required to raise a pound one foot high. If the motion of the point of application be in the *opposite* direction to that of the force, the work is done against the force. If the motion be perpendicular to the direction of the force, no work is done by or against the force. Thus, the work spent in projecting a curling-stone, in opening a massive gate, or in turning a large fly-wheel or grind-stone, has nothing whatever to do with the force of gravity—the body moved, in all these cases, is, as a whole, neither raised nor lowered as regards its distance above the earth's surface. If the direction of the force be oblique to the direction in which the point of application moves, we must resolve the force, by the law of the *Parallelogram of Forces* (See *COMPOSITION OF FORCES*), into two components, one in the direction of motion, the other perpendicular to it. The former is the working component; the latter, as we have just seen, does no work. A good illustration of this is found in the case of raising stones from a quarry by carting them up a series of inclined planes, as contrasted with hauling them up vertically. The work done in either case is measured by the product of the weight of the stones, and the height through which they have been raised; and thus, for the same load of stones, it will be the same whichever process is adopted. This is evident from the property of the inclined plane—viz., that the force required to support a body resting on the plane (which is the force that has to be overcome when we haul it up the plane) is to the weight of the body as the *height* of the plane to its *length*. Hence, this force, multiplied into the length of the plane, gives the same product as the whole weight into the height of the plane; and these are the two quantities of work we are comparing.

When work is done upon a body, there is always an increase of velocity, unless other forces act on the body, so that it does an equal amount of work against them. Thus, if we push a movable body, such as a cart, along a road, the velocity gradually increases, and would increase indefinitely were there no friction and no resistance of the air (forces against which work has to be done), and could we move fast enough to keep continually pushing it, however great its velocity may become. If, on the other hand, by means of a rope and pulley, we raise a stone, if once started, it will ascend uniformly, so long as we pull with a force just equal to its weight, because, then, as much work is done on the stone by the hand as it does against gravity. If we pull with a force greater than its weight, we do more work on the stone than it does against gravity, and the upward velocity increases; if with a force less than the weight, the stone has to do more work against gravity than is done on it by the rope, and its velocity upwards becomes less. The measure of the excess of work done on a body over that which it does against resistance, is the *increase of the product of half the mass into the square of the velocity*—i. e., of what was formerly called the *Viv-voix* of the body, what is now called its *Actual*, or preferably, its *Kinetic Energy*. See *FORCE*. Hence, as it is evident that if a body, or system, be acted on by a set of forces which are in equilibrium, it will have no tendency to lose or to acquire velocity, its kinetic energy will remain unchanged, and therefore *as much work must be done upon it by some of the applied forces, as it does against the rest, in any displacement so slight as not to change the circumstances of the particular arrangement*. That is, when forces are in equilibrium on a body, if the body be slightly displaced, the sum of the products of each force by the effective component of the displacement of its point of application is zero—the product being positive when the force does work, negative when work is done against it. This is the celebrated principle of *Virtual Velocities*, the term virtual velocity having been, very inconveniently, applied to what we have called above the effective component of the displacement of the point of application of a force. It was often employed as the basis of the whole of Statics.

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and very curious attempts have been made to give proofs of it (independent of the laws of composition of forces), especially by Lagrange. But the principle of Work, or Energy, of which that of Virtual Velocities is a mere particular case, and which is at once applicable to the whole range of Dynamical Science, is distinctly enunciated by Newton in a Scholium to his Third Law of Motion. See MOTION, LAWS OF. His words are memorable, and should be universally known—*Si æstimetur agentis actio ex ejus vi et velocitate conjunctim; et similiter resistens reactio æstimetur conjunctim ex ejus partium singularum velocitatibus et viribus resistendi ab earum attritione, cohesione, pondere, et acceleratione oriundis; erunt actio et reactio, in omni instrumentorum usu, sibi invicem semper æquales*. Newton has defined what he means by the velocity of an agent—viz., the component of the velocity of its point of application which is in the direction of the agent. He has also shewn what is the measure of resistance arising from acceleration (see VELOCITY); so that, merely using modern terms instead of those employed by Newton, but in nowise altering the scope of the above remarkable passage, we have the following version of it: *Work done upon any system of bodies (literally, the parts of any machine) has its equivalent in work done against friction, molecular forces, or gravity, if there be no acceleration; but if there be acceleration, part of the work is expended in overcoming the resistance to acceleration, and the additional kinetic energy developed is equivalent to the work so spent*.

When work is expended in overcoming the resistance to acceleration, i.e. the Inertia of a body, we have its equivalent in additional kinetic energy. When it is expended against gravity, as in raising a weight or bending a spring, we have it stored up in a dormant form as *Potential Energy*. See FORCE. When it is expended in overcoming friction, there appears at first sight to be no equivalent; but the comparatively recent researches of Joule (q. v.) and others have satisfactorily accounted for its disappearance, by proving its quantitative transformation usually into heat, sometimes into other forms of molecular energy. But to pursue this point would lead us again to questions already treated at some length in the article FORCE. There is one remark, however, which it is important to make. In compressing a gas, in the receiver of an air-gun for instance, we can never recover as useful effect all the work expended. The reason is, that a gas is *heated* by compression, so that part of the work spent is converted into this heat, conducted through the metal, and by the principle of *Dissipation of Energy* lost, at least in part, to man. Had we a gas which could not be heated by compression (take the imperfect analogy of a space filled with fine spiral springs), we should recover, by allowing it to expand, all the work expended in the compression.

One other remark remains to be made. It will be noticed that Newton speaks of the action of an agent as the product of the agent and the component *velocity* of its point of application. This is what we now call *Rate of doing Work or Horse-power*. Watt estimated a horse-power of 33,000 foot-pounds per minute, or 550 foot-pounds per second. This is probably too high; but it is constantly employed in engineering calculations. A curious quantity, sometimes employed as regards steam-engines, especially those employed for pumping mines, is the *duty*, which is measured by the number of foot-pounds of work done by a hundred-weight of coals supplied to the furnace. A similar mode of comparison is now applied to steam-engines for agricultural purposes, &c.

The quantity of work which can be got out of any machine, human, animal, or other, depends in many cases on the rate at which it is done, or the horse-power actually exerted. An average man can easily work at the rate of a horse-power for a few minutes at a time; but if he were to work at no other rate, he would do very little work in a day. Very singular investigations have been made, both theoretically and experimentally, as to the most profitable rate of doing work, and their results are highly interesting. But to discuss them properly would require more space than we can afford. The table on preceding page, due to Poncelet, gives at least approximate notions of the horse-power employed, and the whole work done, in a working-day, by men and animals variously applying their exertions.

WORKHOUSE, the name given to municipal institutions, in England, in which paupers are supported and maintained. The earliest mention of them is to be found in stat. 13 and 14 Car. II. c. 12, authorising workhouses to be erected in the cities of London and Westminster, to which rogues and vagabonds might be committed, by

any two members of the "Workhouse Corporation," a Board created by the act, with the view of restraining them from predatory habits, and compelling them to work for their living. The provisions of this act were, for the first time, carried into effect in the reign of William and Mary, when a corporation, headed by the Lord Mayor of London, fitted up a house in Bishopsgate Street as a workhouse, one part of which, called the Keeper's Side, was devoted to the purpose contemplated by the act of Charles II.—viz., the reception of vagrants and disorderly persons, committed by two governors; while, in the other part, called the Steward's Side, poor children were lodged, and taught various employments and branches of education. A very few workhouses were afterwards erected by local acts; but their general adoption throughout England was first provided for by act 9 Geo. I. c. 7, by which the churchwardens and overseers of the poor, in any parish or town, were empowered, with consent of the majority of the inhabitants, to establish a workhouse, where the poor were to be lodged and maintained. Two or more parishes might unite in having one workhouse, and one parish might contract for the maintenance of its poor in the workhouse of another. Under this statute, buildings began to be erected and hired all over the country, with great zeal for workhouses, in which the whole poor were housed, industrious and profligate alike. Out-door relief, which had been prohibited by the above statute, was reintroduced by 26 Geo. III. c. 23, and, before long, became the rule under a variety of systems, by which assistance was carried so far as to be a bounty on indolence. The poor-rates rose immensely, and it became the subject of general complaint, that the able-bodied out-door pauper enjoyed a degree of comfort which destroyed all stimulus to exertion. The result was the passing of statute 4 and 5 Will. IV. c. 76, which has remodelled the whole administration of the poor-law, and greatly extended the workhouse system. The Commissioners appointed by that act, and the public Board substituted for these Commissioners in 1843, and made permanent in 1867, have been empowered, under certain restrictions as to consents, to order workhouses to be built, altered, or enlarged as they see fit, and may make by-laws for their government, which the justices are to enforce. The various workhouse officers, including master, matron, schoolmaster, schoolmistress, nurse, porter, and superintendent of out-door labor, have all their proper functions assigned them. Persons having an order, either from the Board of Guardians, the relieving officers, or the overseers, are at all times entitled to admission; and in cases of necessity, applicants must be admitted without an order. If the house be full, the master is bound to refer the applicant to the relieving officer, whose duty it is to find him relief elsewhere. Casual poor wayfarers, admitted by the master or matron, are to be kept in a separate ward; and by 34 and 35 Vict. c. 108, the guardians of every union are bound to provide within their respective unions casual wards with such fittings as furniture as the Poor-Law Board, in their judgment—regard being had to the number of casual paupers likely to require relief—shall consider necessary. There are various statutory enactments regulating the discipline of workhouses. Refusal to work at any suitable employment, intoxication, or other misconduct, is punished with imprisonment and hard labor, not exceeding 41 days. A pauper absconding with clothes or other property belonging to a workhouse, is liable, under 7 Vict. c. 101, and 13 and 14 Vict. c. 101, to imprisonment and hard labor. The usual rule, in accordance with which man and wife are separated, is, by 10 and 11 Vict. c. 109, relaxed when they are above 60 years of age. By 11 and 12 Vict. c. 110, persons professing to be wayfarers or wanderers are to be searched on admission, and any money found on their persons is to be applied to the common fund of the union; and an applicant for relief concealing such money, is to be punished as a disorderly person. In every workhouse, a register is to be kept of young persons under 16 years of age who are hired as servants or bound apprentices, and the relieving officer is bound to visit them twice a year, and inquire into their food and treatment. By 31 and 32 Vict. c. 23, a register of religious creeds is to be kept in every workhouse. By 29 and 30 Vict. c. 118, the Poor-Law Board is empowered to direct the guardians to provide proper drainage, sewers, ventilation, fixtures, furniture, and medical and surgical appliances in every workhouse.

Workhouses are of various sizes. One of ordinary dimensions comprehends accommodation for 450 to 700 inmates of both sexes and different ages; others,

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populous neighborhoods, as near Manchester, will accommodate 1500 inmates, classification as regards sex and age is an important particular, and is usually all attended to. In some situations, the able-bodied inmates work at field-labor within boundary walls. There is no going in and out at pleasure. A workhouse is a sort of prison under stern, though not unkind discipline, and the guiding principle always held in view is, that the offer of being accommodated shall act as a terror to idly-disposed persons, who are inclined to seek parish relief. The establishment of a workhouse really has this salutary effect; where there is no workhouse, the pressure on the poor-rates is generally excessive. A half-empty workhouse is thought a proof of good poor-law management.

In Scotland, the name workhouse is sometimes given to institutions for the support of paupers, but their correct legal designation is *POORHOUSES*. Previous to act 8 and 9 Vict. c. 83, establishments for the reception of paupers had been erected in many of the larger towns of Scotland, and the expense connected with their maintenance was considered a proper charge on the funds. Admission to these almshouses was granted, as a matter of favor, to the more deserving of the aged, infirm, and friendless poor. No system of discipline was enforced, as any improper conduct could at once be checked by expulsion of the delinquent.

Act 8 and 9 Vict. c. 83, which made a complete change in the poor-law system of Scotland, affords powers for the erection of new poorhouses, and for the enlargement and greater efficiency of those that previously existed. The classes of poor for whom they are designed are described as "the aged and other friendless and impecunious poor," and "those poor persons who, from weakness or facility of mind, or by reason of dissipated or improvident habits, are unable to take charge of their own affairs." The Parochial Board of any parish, or combination of parishes, which contains above 5000 inhabitants, may erect a poorhouse as soon as a resolution to that effect has been approved by the Board of Supervision. Two or more contiguous parishes, with the concurrence of the Board of Supervision, may build a poorhouse for their common use; but no poorhouse can be built, nor any existing poorhouse enlarged or altered, until the plans have been approved by the Board of Supervision. The Parochial Boards of parishes, or combinations of parishes, in which there is a poorhouse, may receive poor persons from other parishes at rates approved by the Board of Supervision. When two or more parishes unite to build a joint poorhouse, the expense of its erection and maintenance is apportioned as determined by the parishes; and for the purpose of erecting, altering, or enlarging a poorhouse, power is given on certain conditions to borrow money on the security of the future assessments of the parish or combination.

Parochial Boards were empowered by the above act, under the sanction of the Board of Supervision, to frame regulations for the management and discipline of poorhouses. But the Board of Supervision has found it expedient, for the sake of greater efficiency and uniformity of management, to frame a general code of regulations, which, with a few modifications for peculiarly circumstanced parishes, now form the existing rules by which the Scottish poorhouses are administered. The management of each poorhouse is committed to a house-governor and a matron, subject to the orders of a committee of the Parochial Board or Boards of the parish or parishes to which the poorhouse belongs. There are minute provisions for the classification of inmates according to age and sex, the discipline, medical attendance, religious instruction, diet of the inmates, and the duties of the different officers. Each poorhouse is to be visited at least once a week by a committee of two or more members of the Parochial Board, who are to institute an inquiry regarding a number of specified particulars, the answers to which inquiries are to be submitted to the House Committee at each meeting. There are at present about 65 poorhouses in Scotland in connection with 400 parishes.

WORKING-DRAWINGS are the large plans prepared by engineers and architects to guide the workmen in executing the design. Many of these are on a large scale, all buildings and ornamental work having to be drawn out of the actual size of the work.

WORKING-PARTY, a body of soldiers told off, by command, to perform certain

work or labor foreign to their ordinary duties. A small extra pay, called "working-pay," is allowed, averaging about 4d. a day.

WORKINGTON, a market-town and seaport of Cumberland, about a mile from the mouth of the Derwent, 7 miles direct north of Whitehaven, and the same distance by railway. Its harbor, furnished with a break water and several quays, is safe and commodious. To the coal-mines in the vicinity the town chiefly owes its prosperity—great quantities of coals being exported—but iron-foundries, malt-kilns, flour-mills, shipbuilding yards, rope and sail-cloth factories, breweries, and chemical works are in operation. Salmon fishery is carried on in the river. Railways run north, south, and east from W., establishing communication in all directions. In 1875, 235 vessels, of 23,036 tons, entered the port, and 606, of 76,077 tons, cleared. Besides coals, the exports are pig and malleable iron, and the imports timber, &c. Pop. (1861) 6467; (1871) 7979.

WORKS, Board of. By 46 Geo. III. c. 142 (altered by 50 Geo. III. c. 53), the management and control of public works and buildings, of which the expenses are defrayed from the crown revenues or parliamentary grants, were intrusted to an officer called the Surveyor of his Majesty's Works and Public Buildings, whose duties included the superintendence of the erection and repair of royal palaces, and buildings used for the various branches of government, and the management of public museums and parks. In 1832, the duties of this officer were transferred to the Commissioners of Woods, Forests, and Land Revenues (see **WOODS AND FORESTS**); but this arrangement eventually resulted in a complaint that the crown revenue was applied too easily to the execution of public works and improvements, by which means the Exchequer was deprived of the funds which were due to it in exchange for the Civil List, and parliament was unable to exercise the proper control over an important branch of public expenditure. The department of Public Works was therefore again separated, in 1851, from that of the Woods and Forests, and placed under the management of a new Board, called the Board of Works and Public Buildings, composed of a First Commissioner, specially appointed, who is a political officer, and has a seat in the cabinet, together with the Secretaries of State, and the President and the Vice-president of the Board of Trade, who are *ex-officio* commissioners. In addition to the control over public works and buildings, possessed by the former united Board, the Board of Works has also the management of the parks in the metropolis, including the public parks formed under recent acts, and of Richmond, Greenwich, Bushy, Phoenix, and Holyrood Parks, and the public gardens at Kensington, Kew, and Hampton Court. Among the duties of the Board are, the providing of public walks, and access to the national buildings and collections—a branch of administration, which has, of late years, assumed a prominence which it did not formerly possess. The Board is also charged with many arrangements and responsibilities connected with the making of new streets and roads, in London and elsewhere, and the erection and repair of public statues. The Board of Works is under control of the Treasury, to whose sanction all large estimates for public works must be submitted. The Treasury appoint the secretary, clerks, and other officers of the establishment; and with the sanction of the Treasury, the commissioners appoint or employ such architects, surveyors, &c., as may be necessary. The salaries and expenses of the department, and the charges for all her Majesty's public works, are annually voted by Parliament.

WORKSHOP REGULATION ACT, 1867 (30 and 31 Vict. c. 146), is an important act for regulating the education of children, and the hours of labor for children, young persons, and women who are employed in places not subject to the Factory Acts. Its application is wide, as the definition of a "workshop" includes every place where any handicraft is carried on, "and to which, and over which, the person by whom such child, young person, or woman is employed, has the right of access and control." The principal provisions of the act as to the hours of labor are: (1) That no child under the age of eight shall be employed in any handicraft in any workshop; (2) that no child under thirteen shall be employed for more than six hours and a half each day, or before 6 A.M., or after 8 P.M.; (3) that no young person under eighteen, and no woman shall be employed more than 12 hours out of any period of

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24 hours, or shall be employed between 9 P.M. and 5 A.M., and that the intervals for meals and rest shall not be less than an hour and a half in all; (4) that, except in retail establishments employing not more than five persons, no such child, young person, or woman shall be employed after two o'clock on Saturday, and that in no case shall they be employed on Sundays; and (5) that no child under eleven shall be employed in grinding in the metal trades or in fustian-cutting. From these general rules, the act itself makes a few exceptions, and a limited power is given to the Home Secretary to make others. The regulations as to education are: (1) That every child under thirteen, who is employed in a workshop, shall attend school for at least 10 hours in every week; and (2) that in computing the time at school, no time shall be included in excess of three hours at once, or of five hours in one day; or on Sundays; or before 8 A.M. or after 6 P.M. The obligation to carry out the regulations as to education, is laid (under penalties) both on the parent and on the employer; and the latter is authorised, on the application of the teacher, to pay him for the schooling a weekly sum out of the child's wages.

The act was amended in 1871 (c. 19), so as to make Jews who closed their workshops on Saturday, exempt from penalties should they work on Sundays. It was also amended in the same year (c. 104), so as to give the Home Secretary power to make exemptions from its strict operation in the case of trades which depend on the weather and seasons. The duty of enforcing the provisions of the Workshop Acts was placed on the inspectors of factories.

WORKSHOP (anciently *Wirkenshop*), a town of Nottinghamshire, England, 24 miles north from Nottingham, on the right bank of the Rytou, a branch of the Idle, and near the Chesterfield Canal, which communicates with the Trent. It is situated near the northern extremity of Sherwood Forest. The town is generally well built, and great sanitary improvements of drainage and sewerage have recently been effected. There is a fine old church in the Norman style, with two lofty towers. W. was formerly noted for its Augustine monastery, of which, however, there are few remains. Maltng is carried on here to a very great extent. Much barley is grown in the neighborhood. There is some trade in flour, timber, &c. W. is also a station on the Manchester, Sheffield, and Lincolnshire Railway. Pop. (1871) 10,409.

WORM FEVER, is a popular name for the affection more scientifically known as *Infantile Remittent Fever*. Although it is a disease which presents great differences in its course and symptoms, according to the circumstances which have given rise to it, its characteristic symptoms will be found to point (as Sir Henry Marsh, the eminent Dublin physician, long ago observed) to the mucous membrane as the original seat of morbid action. The disease seldom occurs during the first year of life; but from the second to the twelfth year, it is an affection often met with. Premontory symptoms usually occur, and may last for some days. These symptoms are thus described by Dr. Evanson: The child looks ill, and loses his color; he is languid or fretful; complains of pain in the head or belly, is drowsy, but rests badly, starting in his sleep, or grinding his teeth. The appetite fails, the tongue becomes loaded, and the breath offensive. Fever now sets in; or the attack may commence with high febrile symptoms, and be ushered in by a cold fit. When once established, the fever is remarkable for the distinctness of the exacerbations, the daily number of which varies in different cases. There is, however, usually one well-marked exacerbation, occurring in the evening, and lasting till morning, and followed by a profuse sweat. There is a common number—namely, one in the morning, one in the afternoon, and a third at night. However cool and lively the child may at other times be, it becomes fretful, hot, and heavy, as the exacerbation approaches. During the febrile period, all the symptoms become aggravated. As the period of remission approaches, these symptoms gradually become less severe, and more or less perspiration appears. As the general disease declines, the intermissions become lengthened, while the exacerbations diminish in duration and in intensity. Worms are often present in remittent fever, and give rise to many of the above-named symptoms; but as the symptoms often remain after worms have ceased to be expelled, the latter cannot be regarded as being always the sole cause of this disease.

With regard to the treatment of remittent fever, the first point is to improve the

condition of the intestinal canal, and to correct the morbid secretions poured into it. "From the deranged state of the secretions," says Dr. Evanson, "the occasional use of a mercurial is often very beneficial; and it may be given combined with an aperient or a diaphoretic, according to the circumstances. The powder of jalap, simple or compound, is that which we prefer, and the addition of some ipecacuanha increases the effect." He recommends the following formula: Powdered jalap, 30 grains; powdered ipecacuanha, 5 grains; calomel, 5 grains; white sugar, 10 grains. From 2 to 5 grains of this powder may be given every three hours, till the bowels are freely moved. He adds that, to give cold drinks, and keep the body cool by light clothing and the use of an airy apartment (while we enjoin quietness, and occasionally exclude the light), is essential to recovery. When the bowels are not irritable, a solution of crystals of tartar (bitartrate of potash) given cold, in the form of *Imperial* (see TARTARIC ACID), possesses many advantages, as it acts on the kidneys, while it allays thirst, and tends to keep the bowels open. In the more advanced stages, when debility sets in, we have found the mineral acids useful. They can be employed much sooner than quinine; but the latter may occasionally be prescribed at the close of the complaint. If there are decided signs of intestinal inflammation, leeches must be applied to the abdomen; when there is mere intestinal irritability, Dover's Powder and the warm bath will give relief. If diarrhoea cannot be checked by other means, turpentine, in doses of one or two drops, rubbed up with gum-water, may be tried. In relation to diet, the great point is to avoid giving such food as leaves a bulky, indigestible residue. When convalescence begins, change of air often affords remarkable benefit.

WORM-GRASS. See SPIGELIA.

WORMS, or Vermes (COMPARATIVE ANATOMY). Most zoologists regard the worms as constituting a subdivision of the ARTICULATA; but one of our latest and best writers on classification, Professor Huxley, confines the synonymous terms ARTICULATA and ANTHROPODA to the Insecta, Myriapoda, Arachnida, and Crustacea; and places the higher worms, or *Annelids*, with the above classes, in a primary division, or sub-kingdom, of ANNULOSA; and the less highly organized worms *Scolecids* (in which he includes the *Rotifers* or wheel-animalcules, the *Trematodes* or flukes, the *Tonniads* or tapeworms, the *Nematodes* or thread-worms, the *Acanthocephala* and the *Gordiaceae*), in a sub-kingdom, to which he applies the term ANNULOIDA. The main reasons of his placing the worms under two great subdivisions are—(1) that the *Annelids* resemble the *Arthropoda* in the arrangement of the nervous system, which constitutes a ganglionated double chain, traversed at one point by the oesophagus; (2) none of the *Scolecids* possess any characters in common with the *Arthropoda* generally, or the *Annelids*, other than those which they have in common with all animals. No scolecid has a definitely segmented body, or bilaterally disposed successive pairs of appendages, nor has it a longitudinal chain of ganglia. These grounds of difference outweigh, in his opinion, the many points of resemblance between the *Annelids* and the *Scolecids*—as (1) the resemblance between the ciliated larvae in many cases; (2) the resemblance between the forms of the mature bodies of many *Scolecids* with that of one of the most familiar of *Annelids*, which is so close as to have acquired for the *Scolecids* the popular name of "worms;" and (3) the fact, that in the *Annelids* we see the representatives of that singular system of vessels which attains a perfect development in the "water-vascular" apparatus of many *Scolecids*. The final settlement of the classification of these animals must be decided by further investigation.

With regard to the general characters of worms, it is well known that they are usually of a very elongated form. In the higher groups, the division of the body into a number of segments is very distinct; while in some of the lower forms no segmentation can be detected. The segments, when present, are usually homonomous, or, in other words, are mere repetitions of one another. The soft and contractile body may be cylindrical or slightly compressed, or it may be flat and broad, and usually presents a distinct dorsal and abdominal surface. The lateral region is often provided, in the higher forms, with special appendages, resembling minute stumps, which take place in the respiratory process. Amongst the cuticular appendages must be mentioned the bristles (*setae*), hairs, hooks, &c., which are often seen. The nervous system of the highest worms—the *Annelids*—

has been already sufficiently described in our notice of Professor Huxley's views. From this condition it appears in the Scolecida to become more and more rudimentary, till in the parasitic worms it totally disappears. The mouth is absent in the lower forms, but in the higher lies in the mesial line of the abdominal surface, in close approximation to the chief nervous (pre-oral) ganglion, from which most of the organs of the senses derive their nerves, as the eye, the auditory apparatus, and the organs of touch (especially the lips). Some of the parasitic worms, as the tapeworms, &c., are totally devoid of an intestinal canal; others, as the Turbellaria (with few exceptions), and the Trematoda, have an intestine, but no anal aperture; while the rest have an intestine provided with both mouth and anus. The latter, when present, lies on the posterior part of the body, and sometimes (as in many Turbellaria) on the dorsal surface. Except in the Gephyrea or Sipunculacea, the intestine, when present, is simple, and devoid of convolutions, but is often, as in the leech, provided with lateral blind sacs. The vascular system in the most highly organised worms consists of a closed system of arteries and veins, presenting modifications in different genera. A large vessel which runs beneath the dorsal integument, may be seen under a microscope to contract and propel the blood forward, thus fulfilling the functions of a heart, and being the homologue of the dorsal vasiform heart of insects; while a corresponding venous trunk conveys the blood in an opposite direction, and runs along the under surface of the body. These great trunks are united at each segment by transverse vessels which carry the blood from the ventral vein to the dorsal artery. In the Nematelmin, or parasitic round-worms, the system is much simpler; and in the lowest worms, no trace of true blood-vessels is discernible. None but the Annelida (q. v.), or highest worms, possess special respiratory organs. These occur in various forms. Thus, in the leech and earthworm, a series of pores on each side of the body lead to as many simple sacculi formed by an inward folding of the integument. In the tubicolous Annelida, such as the *Serpula* (a common inhabitant in the aquarium), the respiratory organs are in the form of long flattened branchiæ, radiating from the head, and generally disposed in a spiral form. When not filled by the red circulating fluid, which the Annelids generally possess, they are often beautifully tinted with purple, green, and yellow colors, and form a gorgeous crown. In the *Arenicola piscatorum* (described in the article ANNELIDA), the respiratory organs are seen lying as lateral tufts in the middle of the body (fourteen or sixteen in number on each side). In the lower worms, there are no definite respiratory organs, the process being carried on partly by the surface of the skin generally, and partly by the water-canals noticed in the article TAPEWORM. As a general rule, the worms are hermaphrodites, only one of the five classes into which they are divided—viz., the *Nematelmia*, having the sexes separate. A large number of the lower kinds are parasitical; the others are inhabitants of sea and fresh water, mud, earth, &c.

The worms are arranged by V. Carus into the five following classes: (1.) *Annelata*, corresponding to the *Annelida* of Owen, and described in the article ANNELIDA. (2.) *Gephyrea*, including the Sipunculæ and its allies. (The term is derived from the Greek *gephyra*, a bridge, because the animals included in it form a connecting link or bridge between the Echinoderms and the true articulate animals. (3.) *Chaetognatha* (signifying *shaggy-jawed*, from the Greek *chaiteis*, shaggy, and *gnathos*, a jaw), including the single genus *Sagitta*, which was formerly erroneously placed among the Nudibranchiata Molluscs. As the *Sagitta* is not elsewhere described in this work, we may notice, that it is a little fish-like animal with a distinct head, the mouth armed with several pairs of lateral hook-like jaws, with an elongated body furnished with one or two pairs of fin-like organs, and with a broad and usually bilobed caudal fin. The *sagitta* (so called from its arrow-like appearance) is of small size, swims with great rapidity, and is common in the Mediterranean and in the North Sea. (4.) *Nematelmia* (from the Greek *nema*, a thread, and *helmins*, a worm), which are described in a special article. (5.) *Platyelmia* (from the Greek *platys*, flat, and *helmins*, a worm), or *Flat-worms*, which are divisible into the three orders: (1) *Turbellaria*, including the Planarians, &c.; (2) *Trematoda*, including the Flukes; and (3) *Cestodea*, including the Tapeworms. These orders are described in special articles.

For further information on the subject of this article, the reader is referred to

the various works and Memoirs of Milne-Edwards, Grube, De Quatrefages (especially his "Rambles of a Naturalist"), Schmarda, Blanchard, Leuckart, Williams of Swansea (in the Reports of the British Association), &c. The British worms were not till quite recently described by any competent naturalist, although the labors of Williams of Swansea and Johnston of Berwick (both too early lost to science), are excellent as far as they go. Dr Johnston's "Catalogue of the British Non-parasitical Worms in the Collection of the British Museum" (Lond. 1845, pp. 366), with 20 plates, must be consulted by all who take an interest in this subject, although much of it is now out of date. The most complete work is the "Monograph of British Annelides," published under the auspices of the Ray Society by Dr Mackintosh of Murthly, one of the most distinguished of the younger generation of Scottish naturalists.

WORMS, as a Disease of Infancy. As we have elsewhere (see *ASCARIS*, *ENTOMEOA*, *TAPEWORM*, and *VERMIFUGES*) treated of the natural history of the worms infesting the human subject, and of the remedies to be employed for their expulsion, we shall mainly confine ourselves in this article to the symptoms which are usually considered to be indicative of the presence of worms in children. These symptoms are, however, in reality, only evidence of irritation of the mucous membrane of the intestinal canal, which may be due to other causes than worms, as, for instance, the presence of indigestible matter, unhealthy secretions, or the existence of a morbid condition of the membrane itself. "Indeed, the latter," says Dr Evanson, "would seem necessary, in many instances, for the production of any symptoms, although worms were present; as they have been passed by children in perfect health, who experienced no inconvenience on their account. Even the evacuation of worms does not prove that the symptoms present were caused by them, though doubtless they are likely to have been aggravated thereby. The worm may have been but an accidental accompaniment—a morbid condition of the mucous membrane being the true source of the symptoms."—"On the Diseases of Children," 4th ed. p. 345. Although all the symptoms commonly referred to the presence of worms may exist without them, yet there is a group of symptoms which pretty certainly indicate their presence, and which, when occurring together, should, at all events, excite our suspicions. These symptoms are divisible into (1) those dependent directly on the presence of worms in the intestines; and (2) those connected with the sympathetic relations of the digestive organs, and due to some form of reflex nervous action.

(1.) "Worms," says Dr Evanson, "may be suspected to be present when a child looks pale and grows emaciated, while his belly swells and becomes hard—a gnawing, pungent, or twisting pain being felt in the stomach or about the navel. The appetite is usually precarious, at times voracious; the breath is fetid; and the bowels often deranged, being alternately purged or costive, and much mucus passed in the stools. There is commonly picking of the nose, or irritation (often excessive itching) is felt in the lower part of the bowels; and when a child is old enough, he may complain of a sense of sinking or fainting, which seems to attend particularly on the irritation caused by worms. When symptoms are present, and cannot be accounted for by the existence of disease of the mucous membrane or of the mesenteric glands, we have good reason for believing that worms are their cause."—*Op. cit.*, p. 347.

(2.) Amongst the most marked sympathetic symptoms are those of the head. The sleep becomes unquiet, and the little patient is liable to start up suddenly from slumber; grinding of the teeth is common; the pupils are often dilated, and there may be headache, and sometimes convulsions—symptoms painfully like those of Hydrocephalus (q. v.), but often disappearing on the expulsion of worms. A dry cough, unaccompanied by any signs of disease of the thoracic organs, is regarded as a sympathetic or reflex symptom of worms; and vomiting, hiccough, diarrhoea, tenesmus, and bloody stools often accompany their presence. The Round-worm (*Ascaris lumbricoides*) may be present in the small intestine (its ordinary seat) in large numbers without occasioning any disturbance; but when it does give rise to symptoms, the most prominent are sharp colicky pains about the navel, faintness, great emaciation, and voracious appetite. The Thread-worm (*Ascaris* or *Oxyuris vermicularis*) chiefly occurs in the rectum where it often exists in large numbers, looking like bits of cut thread. In a recently voided stool, they are seen to be in rapid motion; hence they are called *Ascarides*.

(from the Greek *askaridzein*, to jump), and hence also, in all probability, the great distress which they occasion as compared with the quiet round-worms. The characteristic sign of the presence of these thread-worms is the itching and irritation felt in the rectum.

WORMS, an ancient and interesting but decayed town of Hesse-Darmstadt, in a highly fruitful district on the left bank of the Rhine, 20 miles south-east of the town of Darmstadt, and communicating with Mainz and Mannheim by railway. Pop. (1875) 16,597. Among its churches, the chief is the cathedral, a massive building in the Byzantine style, with four towers, founded in the 8th, and completed in the 12th century. On a hill near the church called the *Liebfrauenkirche*, a highly esteemed wine, called *Liebfrauenmilch*, is grown. The manufacture of polished leather employs 1200 hands; tobacco is also manufactured, and a trade in the wines and the agricultural produce of the vicinity is carried on. W. is one of the oldest cities of Germany, and is the scene of the *Nibelungen-Lied* (q. v.). It was occupied by the Romans, destroyed by Attila, and afterwards rebuilt by Clovis. It was frequently the residence of Charlemagne and his Carolingian successors, was the place of convocation of many German diets, and was erected into a free imperial city by the Emperor Henry V. The most famous diet held here was that at which Luther defended his position as a Reformer before Charles V. and the assembled princes and statesmen of the empire. See **REFORMATION**. The industry and commerce of W. were great during the middle ages, and its pop., as far back as the time of the Hohenstaufens, averaged 60,000, and even amounted to 80,000 at the close of the Thirty Years' War, but it was almost wholly destroyed by the French in the destructive war of 1689; and though soon after it was rebuilt on a smaller scale, it has never recovered its former prosperity. The site of the old town is only partially occupied by the present one, the rest being laid out in gardens. Here, in 1743, an offensive and defensive alliance was entered into by Great Britain and Austria with Sardinia.

WORMS, an island with an area of about 86 sq. m., belonging to the Russian government of Esthonia, and lying to the east of Dagö. It is flat and generally well-wooded in the interior, and throws out numerous steep promontories, round which strong currents run, so that, often for months together, it is cut off from all intercourse with the neighboring islands of Oesel, Dagö, Runö, &c., as well as with the mainland; and thus the inhabitants, who are of Swedish origin, have remained unmixed with foreign elements. A stranger is a rare and astonishing phenomenon on this island; and he, in his turn, is not less surprised at the peculiar old Swedish dialect, the architecture, and the manners and customs of this small, poor, but happy insular people.

WORM-SEED is the popular name for *santonica*, from which *Santonin* (q. v.) is extracted.

WORMWOOD is the popular name for *Artemisia absinthium*. It not only acts as an anthelmintic, as its name implies, but it likewise possesses tonic and stimulant properties, which prevent the reproduction of worms after their expulsion. An *Infusion of Wormwood*, made by pouring a pint of boiling water over an ounce and a half of the dried plant, letting it stand for an hour, and straining, taken in doses of a couple of ounces once or twice a day, is a very good domestic tonic, and may be prescribed with advantage even in cases where worms are not suspected.

WORSAAE, Jens Jacob Aamssen, a distinguished Danish archaeologist, was born in 1831 at Veile, in Jutland, where his father held the post of *justitsraad*, or councillor of justice. W. received the rudiments of his education at the Gymnasium of Horsens, from whence he proceeded, in 1853, to Copenhagen, with the intention of studying theology. Having, however, soon exchanged his theological studies for law, and again as speedily relinquished the latter, he turned his whole attention to the history and archaeology of the north, which had from an early age presented special attractions to his mind; and in 1858 he obtained the place of assistant in the Royal Museum of Northern Antiquities at Copenhagen, which was then under the direction of the able Danish archaeologist, C. J. Thomsen, to whom this most valuable collection owes its origin and its present state of excellence. In 1864, appeared W.'s important work, entitled "*Runamo og Bravalla Stenar*," in which he, with consum-

mate skill and profound erudition, definitely settled the long-pending doubts as to the authenticity and character of the Bleking rock inscriptions, and satisfactorily shewed, that the supposed runes were no runes at all, but the mere weatherings of the rock; and consequently, that the interpretation given by the great Icelandic scholar, Finn Magnussen (q. v.), had no existence but in the mind of its author. This bold but conclusive solution of a long-pending problem, which, from the days of the great Danish historian, Saxo Grammaticus, had occupied the attention of the most learned men of the north, at once placed W. in the foremost rank of northern archaeologists; and the numerous works and monographs which have appeared from his pen since then, have fully justified the high promise given by his early labors. During the ten years intervening between this period and his nomination in 1854 to the honorary rank of Professor in the university of Copenhagen, W. made repeated visits to the other Scandinavian lands, to Great Britain, Germany, France, and other parts of Central Europe, which retained traces of the former presence of the Northmen. The Danish government defrayed the expenses of several of these journeys, the results of which have been the publication of numerous works and papers of interest, among which we may instance his "*Minder om de Danske og Nordmændene i England, Skotland og Ir, and*" (Copenhagen, 1851); or *Memorials of the Danes and Norwegians in England, &c.*, of which an English translation appeared the following year; and his treatise "*Om en forhistorisk sankaldet tysk Befolkning i Danmark*" (Copen. 1849), &c. Some of the most important of his works on the archaeology of his native country are his "*Danmarks Oldtid oplyst ved Oldsager*" (Copen. 1843); "*Blekingeske Mindesmærker fra Hedenold*," 1846; "*Danevirke*," 1848; and his "*Afsbildninger fra det Kongelige Museum for Nordiske Oldsager*," 1854. W. has always shewn himself a warm patriot, and a strenuous opponent of the spread of German tendencies in the duchies, and his views in this direction were forcibly enounced in his "*Jylland's Dansekbed*," a treatise published in 1860, and especially directed against Jacob Grimm's exposition of the question of German national law. W.'s merits have been fully recognised by his countrymen; and the Danish government has constantly shewn its sense of the estimation in which he was held, by placing him at the head of all important commissions connected with the archaeology of the country, appointing him to important posts in connection with the University and Antiquarian Museums, and bestowing upon him various other marks of confidence and respect.

WO'RTSED. Besides the application of this term, explained under **WOOL** and **WOOLLEN MANUFACTURES** (q. v.), it is also applied to the thick loose woollen yarn used for knitting stockings, &c., known in trade as *fingering yarn*.

WORT. See **BAER**.

WORTHING, a fashionable and rapidly rising watering-place on the Sussex coast, ten miles west of Brighton. Pop. (1861) 5805; (1871) 7418. Its importance began with the century, as, prior to that date, it was merely a small unvisited fishing-village. The climate is much milder than that of Brighton, the town and its immediate neighborhood being encircled on the north and north-east by almost an amphitheatre of hills, which greatly shelter it from northerly winds, and render it one of the best places for a *winter* resort on the south coast. The town has no noxious trades or manufactures, but is essentially a place of resort for pleasure-seekers and invalids. It has one of the finest and longest sea-parades in the kingdom, being nearly two miles in length. The town has recently undergone a costly system of drainage, and is well supplied with water; whilst its mortality tables bespeak its salubrity, having shewn for several years a rate of only 14·5 per 1000.—See Dr Barker "*On the Climate of Worthing*" (Churchill, London).

WOUNDS may be defined to be divisions of soft parts produced by external mechanical force. They have been classified by surgical writers in various ways, but the most useful arrangement is that which is adopted by Mr. Paget, in his admirable *Memor* on "*Wounds*," in Holmes's "*System of Surgery*," and is based on their mode of infliction. They are thus divided, first, into *open* and *subcutaneous* wounds: the former including those in which the outer part of the wound is almost or quite as extensive as the deeper part; and the latter, all those in which the outer part of the wound is very much smaller than the

deeper part. These wounds (especially those of the first kind) may be further divided into (1) *incised wounds*, such as cuts or incisions, including those which remove a portion of the body; (2) *punctured wounds*, such as stabs; (3) *contused wounds*, in which the divided parts are bruised or crushed; (4) *lacerated wounds*, in which there is tearing of the tissues; (5) *poisoned wounds*, in which some poison or venom is inserted; and to these may be added, as a special variety, (6) *gunshot wounds*.

Simple, open, incised wounds will be more fully noticed than any of the others, because they have been most fully studied, and in their surgical relations are the most important. In a clean cut, whether made accidentally or in a surgical operation, three things are chiefly to be observed—viz., the opening or gaping by the retraction of their edges, the bleeding, and the pain. The gaping of a wound is caused by the retraction of the various tissues which are divided. Of the various tissues, the skin exhibits the greatest degree of retraction, and then (in the order in which they stand) elastic tissue, cellular or connective tissue, arteries, muscles, fibrous tissues, nerves, and cartilages. In addition to the immediate gaping of fresh wounds, many wounds, if they be not prevented, will continue to retract for a long time. For example, in stumps that heal slowly, the limb terminates in a cone, in consequence of the prolonged retraction of the muscles. The bleeding from an incised wound depends chiefly on the size and number of the divided vessels, and on their connection with the surrounding parts, but to a certain extent on the previous condition of the wounded part, or on the peculiar constitution of the patient. Gradually, with or without surgical help, the vessels cease to bleed; and then, if the wound be left open, there is an oozing of blood-tinged serous fluid, succeeded gradually by a paler fluid, which collects like a whitish film on the surface, and contains an abundance of white or colorless blood-cells, imbedded in a fibrinous (and therefore spontaneously coagulating) fluid. The nature of the parts cannot be made clear by any description to those who have not felt it; and it is more than probable that a similar wound inflicted on two or three persons would occasion different degrees of pain in each. There are also differences, as Mr Paget has pointed out, "in both the kind and degree of pain, according to the place and manner of the wound. Thus, in regard to the skin, wounds of the face and of the extremities of the fingers and toes seem to be amongst the most painful; those of the back amongst the least so; and wounds cut from within are less painful than those from without. The skin appears far more sensitive to wounds than any of the deeper structures, except the nerves of sensation themselves; but any part (as periosteum or tendons) may become, by disease or distention, highly sensitive."—*Op. cit.*, p. 551. The local consequences of an incised wound are indicative of inflammation. In the course of an hour or more, the edges of the wound and the adjacent parts become swollen and abnormally sensitive, feel hot and aching; the sutures (if any have been inserted) become tighter, and the edges and intervening spaces gape in consequence of the swelling. These symptoms gradually subside in two or at least four days, unless there is some abiding source of irritation. Except in very severe wounds, no general consequences are apparent. In these exceptional cases, as in amputations, for example, a shock and subsequent reaction (both of which are described in the article SHOCK) are observed. The duration of this feverish reaction or traumatic fever does not seem to bear any fixed relation to the severity of the injury. Sometimes it subsides within twenty-four hours; more often, after large wounds, it does not subside for three or four days, when the pulse and breathing gradually return to their natural standard, and the skin becomes soft and cool. The beginning of suppuration often coincides with the subsidence of the fever. If the fever should last more than four or five days after the receipt of the injury, there is probably some persistent irritation or some morbid complication.

The healing of open incised wounds may be accomplished, according to the high surgical authority from whom we have already quoted, in five different ways, if we include those in which the process is assisted by treatment—viz. (1) by immediate union, or (in surgical language) by union by the first intention; (2) by primary adhesion, or union by the adhesive inflammation; (3) by granulation, or by the second intention; (4) by secondary adhesion, or the third intention—i. e., by the union of granulations; and (5) by scarring under a scab, the so-called subcutaneous cicatrization. Healing by immediate union takes place when the wounded parts being placed

and maintained in contact, first stick together, and then become continuous, without the formation of any new material as a connecting medium. For example, a flap of skin is raised by dissection in the removal of a tumor or a mammary gland, and is then replaced on the subjacent parts. In three days at most, the union may be complete, without any indication of inflammation, there being no evident efflux of blood, no exudation of reparative material, and no scar. In *healing by primary adhesion*, lymph exudes from both cut surfaces, becomes organised, gradually connects the cut surfaces, and at length forms between them a firm layer of connective tissue, covered with a thin shining cuticle. These steps are well seen after the operation for hare-lip, for example. In *healing by granulation*, the wound becomes coated over with the white film, containing colorless blood-cells, as already described. If these glazed surfaces are brought and kept together, they will probably unite, the film becoming organised, and contributing to form a bond of union; but if the wound be left open, the film increases, and takes part in the formation of Granulations (q. v.). We cannot enter into the history of these granulations, and can only remark, that they are finally developed into a scar, consisting of fibro-cellular or connective tissue, with a superficial layer of epidermis. The completion of the healing is accomplished by the gradual improvement of the scar, in which the connective tissue becomes more perfect in its character, and the cuticle becomes thicker and more opaque. *Healing by secondary adhesion*, or by third intention, "is accomplished by the union of two granulating surfaces (e. g., those of two flaps after amputation) placed and maintained in contact. In this state the two surfaces simply unite, or else new material, produced from either or both surfaces, adheres to both, is organised into continuity with both, and then unites them."—Paget, *op. cit.*, p. 586. *Healing by scabbing*, or under a scab, is, according to the same authority, the most natural, and in some cases the best of all the healing processes. In animals, it is often observed that if a wound be left wide open, the blood and other exudations dry on its surface, and form an air-tight covering, under which scarring takes place, and which is cast off when the healing is complete. In man, this process is less frequent, because, in the first place, exudations seem to be more often produced under the scab, which detach its and prevent the healing; and secondly, surgical interference seldom allows this method to have a fair trial.

Such are the several modes of healing of simple, incised, and all open wounds. We have now to consider the nature of the processes therein concerned. Every wound is followed by more or less tendency to an inflammatory process. This tendency may not proceed beyond an increased insensibility of the part and a slight efflux of blood, and there may be no inflammatory exudation; and this is the best condition for healing by immediate union in which no new material is required; or the inflammatory process may go on to the production of lymph, and then cease—a condition essential to healing by adhesion. In healing by granulation, a very low degree of inflammation (such as is requisite for the effusion of the first materials for granulation) is best; while for healing by secondary adhesion or by scabbing, inflammation must be altogether absent. The due understanding of these relations of inflammation and the healing processes of open wounds, affords important aid as to the *mode of treatment*. Nothing should be done to excite or increase inflammation. So much as may be necessary for some of the modes of healing, is sure to occur spontaneously, and more will only do harm; on the other hand, the inflammation excited by the wound does not require special treatment, except in the case of organs (such as the eye, the peritoneum, the lungs, the large joints, &c.) in which serious mischief may be very rapidly induced by inflammation. The position of the wounded part is a subject of considerable importance. "When comfort has, as far as possible, been secured, the next object should be that the wounded part should be relaxed, so that the edges of the wound may come near or together; that no part, and especially no muscle, should be on the stretch, and that the direction of the wound may be such as will allow fluids to flow away from some part of it." In the great majority of cases, healing by immediate union, or by primary adhesion, is most desirable, and should be aimed at—the exceptional cases being wounds through many structures, and exposing considerable surfaces of deep-seated bones; deep wounds whose depth far exceeds their length; wounds of which the deeper portions of the sides cannot be kept in good contact; wounds through parts in a very inflamed or otherwise disordered state; and those which are likely to be troublesome from secondary hæmorrhage—in all of which there is a

fear of the collection of blood and other fluids under the closed integuments. In attempting to induce healing by either of these modes, the points to be attended to are—the arrest of the bleeding, the cleaning of the wound, the exact apposition of its edges, and their maintenance in this position, and the exclusion of the whole wound from the air. If the bleeding arises from vessels of considerable size, they must be tied, twisted, and pressed (according to Simpson's plan) or crushed at their ends; but all these means, and especially ligature, should be avoided if possible, because they are impediments to exact union; and spontaneous closure of the vessels by the action of cold air or water, and pressure with dry lint, is preferable. The cleaning of the wound is best effected by allowing a gentle stream of water to flow over it. Soft sponges are sometimes useful for this purpose; but they must be used as dabbing (not as scrubbing) agents, and the greatest attention must be paid to their cleanness: the sponge used for the wounds or sores of one patient should never be applied to those of another. Apposition is effected by padding and bandaging Sutures (q. v.), and adhesive plasters—the former being useful in deep wounds, while the latter two serve for more superficial wounds. Although a simple incised wound, after its sides have been thus brought into complete contact, may be left exposed to the air, some covering to exclude the air is deemed preferable. Whatever is used should be light, not adhesive, and not prone to decomposition—its object being to protect the wound probably from a deleterious action of the air, and more certainly from sudden change of temperature, friction, and dust. Nothing is better for this purpose than lint soaked in oil, or simple cerate on perforated linen. The following remarks on the dressing of wounds are condensed from Mr Paget's Memoir. No general rule can be laid down regarding the time at which any or the whole of the dressings should be removed. In small wounds about the face, union may be complete in two days; but it is not so firm as to be safe from probable accidents, and metallic sutures possess the advantage of exciting so little irritation, that they may be left in their places for any length of time, till union is perfectly secure. They should therefore not be removed for four days, or, in the case of large wounds, for a week or longer. They should not all be removed at once, and those that are removed should be replaced by strips of adhesive plaster; the union or scar must be cleaned most gently, and protected from the plaster with oiled lint. If, on the first dressing, the union or adhesion of the wound is progressing favorably, then it will usually be sufficient to dress it subsequently on every second day; and if all goes well, the union of small wounds may be regarded as safe at the end of a week, and that of larger ones at the end of ten days or a fortnight.

The rules which we have here given for inducing healing by immediate union or by primary adhesion may, in an emergency, be carried out by any intelligent reader, and ought to be generally known. We do not enter upon the modes of inducing the forms of healing by granulation and by secondary adhesion, as they ought to be carried on under surgical superintendence; nor do we notice the last mode—that of healing under a scab—because it is simply leaving the wound to nature: the most that is required in this case in the way of auxiliary treatment being to cover the scab with dry cotton-wool, to protect it and the subjacent surface from any causes that may excite inflammation.

Of the varieties of wounds, it is sufficient to notice the most important points severally peculiar to each variety. Of *punctured wounds*, the most serious are those which are made with blunt-pointed instruments, such as nails, pitch-forks, iron spikes, &c., for by these the injured parts are not so divided as that they may retract, but are pressed aside with much bruising, and can close again as soon as the instrument is withdrawn; and in this lies the chief danger of these wounds, because blood or other fluids are likely to extravasate into them, and cannot readily escape. These fluids, by decomposing or by mere presence, may excite inflammation, and thus cause deep and confined suppuration, and great destruction of tissues. Some of the worst forms of these wounds are those produced by sharp teeth, probably (as Mr Paget suggests) because of the force with which, as they tend to meet, the teeth crush the intervening parts. In *contused wounds*, the great question is, whether their union should or should not be attempted. If union is to be attempted, the rules given for the treatment of incised wounds must be followed, especial attention being paid to their careful cleaning, the removal of clots of blood, and their warm

covering with some soft material, as cotton-wool. When it would be useless, from the extent of the bruises, &c., to attempt union, the following rules, as laid down by Mr Paget, should be adopted: "The part should be kept at rest, and as nearly as possible at its natural temperature. For the latter purpose, and for protection, an excellent dressing is Hut or cotton-wool thoroughly soaked in olive oil, and completely fitted to the part. Dry cotton-wool may be applied over this, or oiled-silk. Water-dressing may be similarly applied, or warm poultices, but they are generally less comfortable. Irrigation is, in some cases, very soothing, especially in ragged wounds, but it should be with tepid water. The methods of the dressing, after the first, may be almost the same as for incised wounds."—*Op. cit.*, p. 568. The treatment of lacerated wounds is almost precisely the same as that of contused wounds. *Poisonous wounds* are sufficiently discussed in the article *VENOMOUS BITES*; and there is a special article on *GUM-SMOK WOUNDS*, which are, in reality, only an important variety of contused wounds.

In conclusion, it must be mentioned that various kinds of wounds are liable to certain complications, of which some are local, and others general or constitutional. Among the former are recurring or secondary bleeding, pain, spasmodic muscular movements, and the presence of foreign bodies; whilst the latter include defect or excess of reaction, traumatic delirium, fever, erysipelas, pyæmia, &c. Some of these complications are treated of in special articles of this work; and for the treatment of the remainder, we must refer to Mr Paget's Memoir, from which most of the details of the present article are borrowed.

WOUVERMANS, Philip, a Dutch painter of note, was born in 1690 at Haarlem. From his father, Paul Wouwermans, a historical painter, he inherited a taste for art. He studied first with his father, and afterwards with John Wynnants. He passed his entire life at Haarlem in the assiduous practice of his art, and died in the year 1668. Though his pictures are now highly valued, he is said to have had little immediate success, and to have lived in poverty, pretty much in the hands of the picture-dealers. His pictures are, for the most part, landscapes of small size, with figures profusely introduced, commonly in energetic action. His battle-pieces, in particular, are greatly admired for their spirit and vigor. He had two brothers, also painters, JOHN and PETER, who executed subjects somewhat similar, and whose works have not unfrequently been attributed to him; but though both artists of considerable merit, they are plainly much inferior to Philip.

WRACK, or *Sea-Wrack*, a name sometimes applied indiscriminately to many of the larger *Algae* of the sea-shores, but also employed to designate the species of the genus *Fucus* (see *FUCACEÆ*), some of the most abundant of which are employed on the British shores for the manufacture of Kelp (q. v.), and are also much used as a manure. The genus *Fucus* has a leathery, dichotomous, generally flat, linear frond, usually furnished with large air-cells, which are included in the substance of the frond; the spores arranged in tubercles, imbedded in mucus, and collected in *receptacles*, through the pores of which they are finally discharged. *F. vesiculosus*, popularly known as *Sea-wares*, *Kelp-wares*, and in Scotland, as *Black Tang*, is extremely abundant on all the rocky shores of Britain, growing between high and low-water mark, and most plentifully near high-water mark, often struggling for existence on the very upper line, and even found among grass and moss in marshy ground occasionally overflowed by the tide. It is the species chiefly employed in the kelp manufacture, because it is more easily collected than any other. It is of a dark olive-green color, sometimes two or three feet in length; the frond flat, entire on the margin, with a central rib; the air-cells spherical, in pairs, sometimes as large as hazel nuts; the receptacles solitary, terminal, turgid, compressed, mostly elliptical. Oxen, sheep, and deer eat it, and seek it on the sea-shore in winter when other food is scarce. In Gotland, it is boiled and mixed with a little coarse flour as food for hogs. It has been used medicinally in glandular affections, probably owing its value to the iodine which it contains.—*F. nodosus* is another very common British species, sometimes called *Knotted W.*, growing nearer to low-water mark than the last, and therefore not so often and easily accessible, but esteemed the very best species for the manufacture of kelp. It has veinless fronds, branched in a somewhat pinnated manner, with large solitary egg-shaped air-cells, in the central line of the frond. It sometimes attains a length of six feet.—*F. serratus* is also

Wrangler
Wren

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very common, and is easily distinguished by its serrated fronds, and the want of air-cells. It is sometimes called BLACK WRACK. It is less useful for help than the other species. In Norway, it is used as food for cattle, generally sprinkled with a little meal. It is preferred to other species for packing crabs and lobsters to be sent to market, as it keeps them moist, whilst, having less mucus than the other species, it is less apt to ferment and putrify. Some other species of *F.* are common British *Algæ*, although much less abundant than these. The use of *W.* for manure is of great advantage to farmers on the sea-coast. This kind of manure is better adapted for light than for clay soils. The effect is beneficial for almost all kinds of crops. The *W.* ought not to be allowed to lie long in a heap, as it is injured by fermentation, but as quickly as possible applied to the land, and covered by the plough.

Some of the *Fuct.* as *F. vesiculosus* and *F. serratus*, on receiving injury by which any part of the frond is broken, throw out a cluster of young sprouts from the injured part.

WRANGLER, the name given at the university of Cambridge to those who have attained the first class in the public mathematical honor examinations. These examinations extend over eight days, the pass in the papers of the first three entitling a student to the degree of Bachelor of Arts, with honors of the third, second, or even first class, according to the number of marks attained. The word wrangler is derived from the public disputations in which candidates for degrees were in former times required to exhibit their powers. The examination is confined to mathematics, pure and mixed; it is conducted by two moderators and two examiners. At the end of the three days, an alphabetical list of those who have attained sufficient marks to entitle them to a degree and honors in mathematics is published. All appearing in that list are entitled to appear at the following five days of examination. In the final list, which shows the number of marks obtained during the eight days, each candidate is placed in order of merit. The honor men who compose the mathematical *tripos* number usually from 120 to 150, and are divided into three classes—*wranglers, senior optimes, and junior optimes*. The head of the *tripos* is called the *senior wrangler*. The number of wranglers varies from year to year. It has rarely been under thirty-five, and has often been forty-five or upwards, the number not being limited otherwise than through the application of a certain high standard of excellence.

WRASSE, or Rock-fish (*Labrus*), a genus of fishes of the family *Labridæ* (q. v.), of the section having cycloid scales, *Cyclotabridæ* of Müller. They have spiny fins, large thin scales, and an uninterrupted lateral line. The mouth is protrusible, with thick fleshy lips, folded so as to appear double. The teeth on the jaws are simple, in one or more rows; the lower pharyngeal bones are completely fused together, and have broad grinding teeth. The form is somewhat perch-like, with the back more straight. There is a single long dorsal fin, the spines of the anterior portion of which are surmounted by short membranous filaments, the posterior portion having short and split rays. The ventral fins are under the pectorals. The colors are generally very brilliant. The species are numerous, abounding in tropical seas, but several of them are found on the coasts of Britain. They chiefly frequent rocky shores, and are generally seen in small shoals, often hiding under sea-weeds. They feed on crustaceans, molluscs, and marine worms. They are often caught by bait intended for other fish, but their flesh is not much esteemed. The BALLAN *W.* (*L. bergylla*, or *maculatus*) is one of the most common British species. It attains a length of about 18 inches, and a weight of more than three pounds. It is bluish green, paler on the belly, all the scales margined more or less broadly with orange red, the blue prevailing in some specimens, and the orange in others. The COOK *W.* (*L. mixtus* or *variegatus*) is not unfrequent on the southern shores of England. Its prevailing color is orange, striped transversely with blue, particularly in the male, the colors of the sexes differing so much that the female has often been described as a distinct species, and is generally known as the RED WRASSE. There are several other British species of this and closely allied genera, as the CORWINE (*Crenilabrus melops*, or *linea*), about six inches long, and of a greenish blue color, varied with yellow. The colors quickly fade after the fish is taken out of the water.

WREATH, WREATHED, in Heraldry. A wreath is a twisted garland of silk of different colours, otherwise called a torse, on which it has, since the 14th c., been

usual to place the crest. The side-view of a wreath thus drawn exhibits six divisions, which are generally tinged with the livery colors—that is, the principal metal and color of the shield. Every crest is now understood to be placed upon a wreath, except when it is expressly stated to issue out of a chapeau or coronet. A wreath, when represented alone, shews its circular form. A Moor's head is sometimes encircled with a heraldic wreath. A wreath is always understood to be the twisted garland of silk above explained, unless otherwise specified; but wreaths of laurel, oak, ivy, &c. sometimes occur, and savages used as supporters are often wreathed about the head and middle with laurel. Ordinaries are occasionally *wreathed*, otherwise called *tor-tills*, in which case they are represented as if composed of two colors, twisted as in the heraldic wreath; as in the coat of Carmichael; argent, a fess wreathed azure and gules.

WREDE, Karl Philip, Prince of, a Bavarian field-marshal, was born at Heidelberg, 29th April 1767. Belonging to a noble family, he early obtained official employment, and in 1792 was assessor to the high court of Heidelberg; in 1798, he was elected "civil commissary" in the Palatinate, and in this latter capacity accompanied for five years the armies of Wurmser, Duke Albert, and the Archduke Charles, in Italy and Germany; and frequently took a direct share in military operations. In 1799, his military career may be said to have commenced by his leading a body of Bavarian volunteers to join the Archduke Charles, and for his distinguished conduct in that campaign he obtained, 15th May 1800, the grade of major-general. After the peace of 1800, he devoted much time and labor to the organization of the Bavarian army; and when war was renewed, found himself at the head of the Bavarian contingent, well disciplined and thoroughly equipped, fighting side by side with his former foes the French, and took a prominent part in most of the campaigns against the Austrians, Prussians, and Russians till 1813. But, after the retreat from Russia, offended at some real or fancied insults which had been offered to him, he returned to Munich, joined the anti-French party, which was headed by the queen and crown-prince; and though his intrigues were put a stop to by the victories of Lützen and Bautzen, he soon after succeeded in bringing about the treaty of 8th October 1813, by which Bavaria joined the coalition against France, and before the end of the same month, was at the head of 70,000 men. Attacked by Napoleon with an inferior force, he was, after a bloody and protracted contest, defeated at Hannau. He was chosen soon after to command the fourth corps of Schwarzenberg's army and though unsuccessful in most of his petty conflicts, contributed considerably to the successful advance on Paris. His services were rewarded by the dignities of field-marshal (7th March) and prince (9th June 1814), and by the gift of the domain of Ellingen. On the brief renewal of the contest during the "Hundred Days," W. was preparing to invade Lorraine, when the battle of Waterloo put an end to the strife. After this period W. was employed on many important missions, and was charged with the pacification of Rhenish Bavaria during the revolution of 1830. He died at Ellingen, 12th December 1838.

WREN, Sir Christopher, a renowned English architect, was born at East Knoyle, in Wiltshire, on the 20th October 1632. His father Dr C. Wren, was Dean of Windsor, and his uncle Dr M. Wren was Bishop successively of Hereford, Norwich, and Ely. At an early age, young W. was placed at Westminster School, under the celebrated Dr Busby, and while yet only in his fourteenth year, was entered a gentleman-commoner of Wadham College, Oxford. Here he made considerable progress in mathematical studies, and attracted the notice of the cultivators of physical science—whether resident at the university or visitors—by his inventions of certain mathematical instruments, and his general zeal and enthusiasm in the pursuit of experimental philosophy. In 1650, he took his degree of B.A., and in 1653, that of M.A., having been previously made Fellow of All Souls. He now also became a member of a society established at Oxford for the improvement of natural and experimental philosophy; and in 1654, is spoken of by Evelyn, in his "Diary," as "that miracle of a youth;" also, in his "Sculptura," as "that rare and early prodigy of universal science." The acquaintance thus begun, ripened into a firm friendship between W. and Evelyn.

In 1655, W. greatly assisted in perfecting the barometer, then only recently invented. In 1657, he left Oxford for London, where he became Gresham Professor

of Astronomy. In May 1661, however, he returned to Oxford, as Savilian Professor of Astronomy. The same year, he received the degree of D.C.L. Before leaving London, W. had, in conjunction with Lord Brouncker, the Hon Robert Boyle, Mr Bruce, Dr Wilkins, Sir Robert Moray, and others, who used to meet together at Gresham College, laid the foundation of the future Royal Society. Before the Society was formally incorporated, the members felt much the absence of W. from their meetings, and one of their first proceedings was to get the king to lay his commands upon him to perfect a design he had in mind of a globe of the moon, and to "proceed in drawing the shapes of little animals as they appear in the microscope." The lunar globe was finished, much to the satisfaction of his Majesty, who placed it in his cabinet of rarities. He also summoned W. from Oxford to assist Sir John Denham with his advice on architectural subjects; the poet Denham having been appointed Surveyor-general of his Majesty's buildings, but possessing little or no knowledge of the subject.

The study of architecture was one to which W. had given great attention, while still a very young man, notwithstanding his devotion to mathematics, astronomy, chemistry, and even anatomy. In 1663, in his capacity of Assistant Surveyor-general, he was offered a large salary to go to Tangier, to survey and direct the works at the mole, harbor, and fortifications; but this commission he declined. In the same year, W. was engaged by the Dean and Chapter of St Paul's to make a survey of the cathedral, with a view to certain projected repairs in that vast fabric. He accordingly drew up a very careful and elaborate account of the state of the building, with suggestions for its improvement, and accompanying drawings and designs. All of these were laid before the king; but before any further steps were taken for the restoration of St Paul's, that building was levelled to the ground by the memorable fire of 1666, and W. was destined to be the architect of the new cathedral, instead of the restorer of the old. The first work actually built from design by W. was the chapel at Pembroke College, Cambridge, in 1663. But in the same year he designed the Sheldonian Theatre at Oxford, which was commenced in 1664, and finished in 1669. In 1664, W. also designed some valuable additions to the buildings at Trinity College, Cambridge; particularly the beautiful western quadrangle known as Neville's Court. To this he added, in 1666, the Library of Trinity College, said by Gwilt to be "one of his finest productions, and one with which he himself was well satisfied. It consists of two orders; a Doric arcade below, open to a basement supported by columns, which has a flat ceiling. . . . The principal story is decorated with three quarter columns of the Ionic order, well proportioned."

In 1665, W. visited Paris, where he made the acquaintance of Bernini, architect of the Louvre, and of other distinguished men. In the following year, he returned, to find the Royal Society earnestly engaged in searching out the causes of the great plague, so soon to be succeeded by the great fire which laid London in ashes. This disaster at once opened a wide field for the exertion of W.'s genius. He formed a plan, and drew designs for the entire rebuilding of the metropolis, embracing wide streets, magnificent quays along the banks of the river, and other well-considered improvements. In rebuilding London, however, few of W.'s recommendations were adopted. He was certainly chosen to be the architect of new St Paul's, one of the finest non-Gothic cathedrals in the world; besides which, he designed more than fifty other churches in place of those destroyed by the fire. The great church of St Paul, built on the model of St Peter's at Rome, was begun in 1675, and completed in 1710, when the last stone was laid upon the lantern by the architect's son, Christopher. Besides the numerous churches mentioned, W. built the Royal Exchange, London, in 1667; Custom-house, London, in 1668; Temple Bar in 1670; the Monument, in 1671-1677; the College of Physicians in 1674-1693; the Royal Observatory, Greenwich, in 1675; the Gateway Tower, Christchurch, Oxford, in 1681-1683; Chelsea Hospital, 1692-1699; Ashmolean Museum, Oxford, 1683; Hampton Court, 1690; Morden College, Blackheath, 1692; Greenwich Hospital, 1696; Buckingham House, 1708; Marlborough House, 1709; the towers at the west front of Westminster Abbey, in 1713; besides the unfinished palace of Winchester, in 1683.

In 1673, W. received the honor of knighthood. In 1674, he married Faith,

daughter of Sir John Coghill, by whom he had a son, Christopher, who survived him; and his wife dying, he married, in 1679, Jane, daughter of Viscount Fitzwilliam, by whom he had issue, a son and daughter. In 1680, W. was elected President of the Royal Society. In 1684 he was made comptroller of the works at Windsor Castle; and in 1688, he was elected Grand Master of the order of Freemasons. He was also elected a member of the House of Commons for New Windsor in 1689, and being unseated on petition, was immediately re-elected for the same place. In 1698 he was appointed Surveyor-general of the Works and Repairs at the Abbey of St Peter, Westminster; and in the same year was again elected Grand Master of the Freemasons. W. died in his chair, after dinner, on the 25th of February, 1723, aged 90 years, and was buried in St. Paul's Cathedral, where the appropriate inscription of "Si monumentum requiris, circumspice," marks his tomb. During his declining years, he was treated with neglect, and even injustice, by the court of England; "one Benson" was appointed by George I. to supersede him in the office of Surveyor-general; and some private individuals carped at his works in a most malevolent spirit. Steele, however, vindicated the fame of his friend in the "Tatler," in which W. is introduced in the character of Nestor; and few have been found since that time hardy enough to call in question the well-merited reputation of Sir C. W. as a distinguished architect, mathematician, and scientific observer.

WREN (*Troglodytes*), a genus of birds of the Creeper family (*Centhidae*), having a slender, slightly curved, and pointed bill, the edge of the mandibles entire; the wings very short and rounded; the tail short, and carried erect; the legs slender and rather long. Their plumage is generally dull. They are natives chiefly of the northern hemisphere, and most of them are American. They live on or near the ground, seeking for insects and worms amongst low bushes, and in other similar situations. The COMMON or EUROPEAN W. (*T. vulgaris*) is found in all parts of Europe, and in the north of Asia. It is more abundant in the northern than in the central and southern parts of Europe, and is found even in the arctic regions. It is a very small bird, only about four inches long, reddish-brown above, with narrow transverse streaks of dark brown, yellowish white below, the greater wing-coverts with three or four small bead-like spots of white. From its peculiarity of form, and its active, lively habits, it is one of the most familiarly known of British birds. It frequents gardens, hedges, and thickets. Its flight is not long sustained; it merely flits from bush to bush, or from one stone to another, with very rapid motion of the wings. It sometimes ascends trees, nearly in the manner of creepers. The male has a loud sweet song. The nest is large for the size of the bird, oval, domed above, with an opening on the side, and is composed of hay or moss, lined with feathers, and generally of materials such that it resembles in color the objects beside it, and is not easily discovered. It is often placed under the thatch of a building, under the turf of a turf-topped wall, against the side of a moss-covered tree, or under an impending bank, always so as to be sheltered from rain. The eggs are usually from seven to ten in number, and the male is assiduous in his attention to the female in supplying her with food during incubation, and afterwards assists her in the care of the young. Two broods are produced in the season. In severe winter weather, a number of wrens often take shelter together in an old nest, or in a hole of a wall; sometimes they roost in byres, to enjoy the warmth proceeding from the cattle. When driven from bushes, the W. is easily run down; and the hunting of wrens on St. Stephen's Day is an old custom in the south of Ireland. In general, however, the W. is almost as much a popular favorite in Britain as the Redbreast. The name *Kitty Wren* is popularly given to it in many parts of the country.—The North American species of W. are numerous; some of them, however, have recently been placed in new genera.—The House W. (*T. cedon*) is larger than the European W., being about five inches long. It is reddish-brown above, barred with dusky, and pale fulvous white below, with a light brownish tinge across the breast. It is abundant in the eastern parts of the United States. It is less shy than the European W., and often builds its nest near houses, and in boxes prepared for it. The nests are made to fill the boxes; and to effect this, a large mass of heterogeneous materials is sometimes collected. The song of the House W. is very sweet. The male is a very bold, pugnacious bird, readily attacking birds far larger than itself, as the blue-bird and swallows, and

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taking possession of the boxes which they have appropriated for their nests. It even attacks cats when they approach its nest.—The WINTER W. (*T. hyemalis*) is so similar to the European W., that it is not easy to state a specific difference. It is common throughout North America, from Labrador to Louisiana, and partially migratory. Several other species are common in North America, as the CAROLINA W. (*Troglodytes* or *Thryophilus ludovicianus*) and the MARSH W. (*Troglodytes* or *Cistophorus palustris*), both of which are found chiefly in the vicinity of water. All of them agree very nearly in their habits with the Common Wren.

WREXHAM, a municipal and parliamentary borough in Denbighshire, and one of the most important towns in North Wales, 11 miles south-west of Chester, on an affluent of the Dea. The town is handsome and lively, and the church, a handsome edifice in Perpendicular, was built about the year 1470, though its tower, 186 feet in height, was not completed till 1500. This church contains a monument and two medallions by Roubilliac. In the vicinity are several collieries, which, together with lead-mines, iron-works, paper-mills, and breweries, give employment to the inhabitants. It is also of very considerable importance on account of its markets and fairs, one of which, in March, lasts for fourteen days, and is attended by traders of all descriptions, and from great distances. W. unites with Donbigh, Holt, and Ruthin in sending a member to parliament. It is a station on the Chester and Shrewsbury Railway. Pop. (1861) 7562; (1871) 8576.

WRIGHT, Thomas, an English antiquary and historian, was born near Ludlow, in 1810, and was educated in the grammar-school of that town. From school, he proceeded to Trinity College, Cambridge, where he took his degree of B.A. in 1834, and subsequently that of M.A. At an early age, W. shewed considerable literary talent, and while still at the university, contributed to "Fraser's Magazine," the "Gentleman's Magazine," the "Literary Gazette," and other periodicals. In 1836, he came to London, and at once commenced the career of a man of letters; and from that time till his death he was continually before the public in the capacity of author, editor, or translator. In 1837, he was elected a Fellow of the Society of Antiquaries; and in the following year, published his first considerable work, entitled "Queen Elizabeth and her Times" (3 vols. 8vo). In this year also, he was one of the two founders of the Camden Society, for which he edited various works at different times, such as the "Latin Poems of Walter Mapes, Letters on the Dissolution of the Monasteries," &c. He was also for some years Honorary Secretary of the Camden Society. In 1848, W., in conjunction with his friend, Mr Roach Smith, he founded the British Archaeological Association. He also took an active part in the formation of the Percy and Shakespeare Societies, and for each of these, from time to time, edited volumes. Upon the death of the Earl of Munster, in 1842, W. was elected to succeed him as Corresponding Member of the Institute of France, an honor never before attained by one so young. There were several candidates; but W. was chosen by a large majority, among whom were two ministers of state, MM. Guizot and Villemain. W. was also a member of the Society of Antiquaries of France, of the Ethnological Society of Paris, of the Royal Society of Northern Antiquaries of Copenhagen, and of other learned societies on the continent and in America.

Of W.'s various works—said to exceed 100 volumes in number, including, of course, translations and works edited for Societies—the following may be regarded as the principal: "Biographia Britannica Literaria," 2 vols., of which the Anglo-Saxon period appeared in 1842, and the Anglo-Norman in 1846; "Essays on Subjects connected with the Literature, Popular Superstitions, and History of England in the Middle Ages" (3 vols. 1846); "The Archaeological Album, or Museum of National Antiquities—the Illustrations by F. W. Fairholt" (1848); "England under the House of Hanover, Illustrated from the Caricatures of the Day" (3 vols. 1813); "Narratives of Sorcery and Magic" (3 vols. 1851); "History of Ludlow" (1852); "The Celt, the Roman, and the Saxon: a History of the Early Inhabitants of Britain down to the Conversion of the Anglo-Saxons to Christianity" (1852; 2d ed. 1861); "History of Ireland" (3 vols. 1854); "Wanderings of an Antiquary" (1854); "Cambridge University Transactions" (3 vols. 1854); "Dictionary of Obscure and Provincial English" (3 vols. 1857); "History of France" (3 vols. 1854–1862); "Guide to the Ruins of the Roman City of Uriconium, at Wroxeter, near Shrewsbury" (1859); Political

Poems and Songs relating to English History, composed during the Period from the Accession of Edward III. to that of Richard III." (3 vols. 1858-1861). These volumes form part of a series of works published under the direction of the Master of the Rolls, in illustration of the medieval history of England; "Les Cent Nouvelles Nouvelles" (3 vols. 1858), being a collection of medieval tales from the only known manuscript of the same, discovered by W. in the library of the Hunterian Museum, Glasgow; "Essays on Archaeological Subjects" (3 vols. 1861); "History of Domestic Manners and Sentiments in England during the Middle Ages, with Illustrations by F. W. Fairholt" (1861); "A History of Caricature and Grotesque in Literature and Art, with Illustrations by F. W. Fairholt" (1865). To these may be added his "Womankind in Western Europe" (1869); "Uricanism; a Historical Account of the Ancient Roman City" (1873); and his translations of Pauli's "King Alfred" and of Napoleon's "Julius Cæsar." He died 23d December 1877.

WRIGHTIA, a genus of plants of the natural order *Apocynaceæ*, containing some of the greatest twining shrubs of the East Indies, such as, attaching themselves in the first instance to trees for support, become themselves at last of tree-like thickness, as well as height, and kill the supporting trees by their choking embrace. The corolla is salver-shaped, with scales in its throat: the fruit consists of two erect follicles. The leaves are simple, generally ovate or nearly so. The timber of some species, as *W. mollissima* and *W. coccinata*, is valuable. *W. antidysenterica*, a native of Ceylon, yields CONNER BARK, a valuable astringent and febrifuge; *W. tinctoria*, common in many parts of India, yields excellent indigo, and was strongly recommended for cultivation on this account by Dr Roxburgh, the produce being large, and the plant less dependent on rain than the species of *Indigofera*.

WRIT is a general term much used in the law to denote a formal document proceeding in the Queen's name, or the name of a judge or other officer of the law. Such is a writ of summons commencing an action at law. In nearly all actions and proceedings, writs of various kinds are issued, which are named from the nature of the particular act to be done.

WRITER, a term vaguely applied in Scotland to a law practitioner or his clerk; in provincial towns more definitely to a law agent practising before the sheriff, and acting as factor in the management of private affairs.

WRITER TO THE SIGNET, or Clerk to the Signet, the name of an important body of legal practitioners in Edinburgh, who derive this designation from having been originally clerks in the office of the Secretary of State, where the different writs that passed under the king's signet were prepared. Act 1587, c. 99, establishing the College of Justice, mentions the Clerks to the Signet as a previously existing body; and though no charter of incorporation is extant, the society is considered entitled to all the privileges of a corporation. The Keeper of the Signet, an officer appointed by the crown, appoints one of the members of the Society of Writers to the Signet his deputy, who is in use to preside at meetings of the Society, and, along with certain other members named by him as commissioners, to manage its affairs. Admission to the Society must be preceded (1) by attendance during two different sessions, or two full winter courses of lectures on the faculty of Arts of a Scottish university; (2) by a five years' apprenticeship; (3) by attendance on four courses of law in the university. Previous to admission, the candidate is examined in scholarship and in law. The whole expense of admission to the Society, including the apprentice-fee of £200, is £410 15s. 6d. The Writers to the Signet have long been the principal body of law agents practising before the Supreme Courts of Scotland; and the individual members of the body are also entitled to practise before the Sheriff Court in all matters which have been transferred by statute from the Supreme Courts to the Sheriff Court, as proceedings in bankruptcy. They possess the exclusive right of preparing the warrants of charters of land flowing from the crown, of signing summonses citing parties to appear in the Court of Session, and all other writs that pass the Signet, as diligences for affecting the person or estate of the debtor. A very considerable proportion of the conveyancing business of Scotland is in their hands, and they are largely employed as factors in the management of private affairs. Most of them are notaries-public. They possess a large and valuable library.

Act 36 and 37 Vict. c. 63, has transferred to a newly-created body, called "Law Agents," the exclusive right of practising before both the supreme and the inferior courts of Scotland. Admittance to this body must be preceded by a five years' apprenticeship, which, if entered on after 1873, must be under an indenture duly recorded and intimated to an officer, called the Registrar of Law Agents, within six months from its commencement. A three years' apprenticeship is to be held sufficient in the cases of a person who has been five years clerk to a law agent, is a graduate in law or arts, an advocate in Scotland or barrister in England, or an enrolled attorney or solicitor in England. The applicant is admitted by the Court of Session after an examination by examiners appointed by the court. Persons who, prior to February 1874, were members of the Society of Writers to the Signet, or of the Society of Solicitors before the Supreme Courts, or Procurators before the Inferior Courts, are entitled, on application, to be enrolled as law agents. For three years, from August 1873, the qualifications for admission are relaxed in favor of persons in course of qualifying as procurators, under the Procurators Act, 1868. Before being allowed to practise before the Court of Session, or any Inferior Court, a law agent must subscribe the roll of that court. Any law agent may, on application to the Court of Session, be admitted a notary-public.

WRITERS' CRAMP, or **SCRIVENERS' PALSY**, is a peculiar kind of local spasm, in which every attempt to write instantly calls forth uncontrollable movements in the thumb, the index and middle finger, so that the pen starts up and down on the paper, and instead of a legible handwriting, a mere scrawl results. "The more," says Romberg, "the patient persists in his attempt, the more the difficulty of using his pen increases; and to the visible and sensible contractions of the muscles of the thumb, contractions of the forearm, and even of the upper arm, are often superadded. Abnormal sensations, especially of a sense of weight and constriction of the hand, or of pain extending from the upper arm to the back, are occasionally present. It is diagnostic of these attacks that they are instantly arrested when the individual ceases writing; and that the hand is capable of every other combination of movements and exertions."—"The Nervous Diseases of Man," vol. i. p. 330. The disease is chiefly confined to middle age, and scarcely ever occurs in women; and there can be no doubt that an occupation entailing much writing predisposes to it, the quality of the paper or of the pen having nothing to do with it. The treatment hitherto pursued, both local and general, has, according to Romberg, been "invariably ineffectual." This is, however, too strong a term, since he mentions a case in which Stromeyer applied the principle of division of the muscles to the cure of writers' cramp, and in one case a brilliant result justified the antispasmodic reputation of tenotomy; the patient being perfectly able to write as early as the fourteenth day after the subcutaneous division of the tendon of the long flexor of the thumb." The same operation was, however, several times performed by Dieffenbach without success. Mr Solly, in his recently published "Surgical Experiences," describes several cases of this peculiar affection, in some of which judicious treatment, combined with entire cessation of writing for a considerable time, led to satisfactory results.

WRITING is the art of fixing thoughts in a palpable and lasting shape, so as to make them known to others. There are two principles employed in this process, either separately or jointly—viz., **Idiographism** and **Phonetism**. An **ideograph** is either a picture of the object the idea of which is to be conveyed, or, at a later stage, some symbol which stands, by common consent, for the object, in which case it is called **Symbolism**. **Phonetism**, on the other hand, is either **Syllabism**—i. e., a combination of consonants and vowels which form a word, or component parts of it—or **Alphabetism**, a system that further breaks up the syllables into their single component parts of vowels and consonants. All systems of writing seem to have originated in **Idiographism**, and to have gradually arrived at **phonetism**. The pictorial mode of **Idiography** gradually led, as indicated, to the **symbolical** mode. The former, also called **kyriological** (Gr. *kyrios*, principal, proper, the opposite of metaphorical or symbolical) writing, contents itself with representing only bodily things, either by fully or partly depicting them, or by merely indicating them by some special characteristic. The latter—the **symbolical** mode—represents abstract things in accordance with their similarity to

corporeal subjects, as in the hieroglyphs of later Egyptian times. Examples of the real delineations of the subjects, or parts of them, which have been replaced by conventional signs, we find at an early period in Egypt, as well as with the Aztecs, with the primitive Assyrians, in ancient China, and in Guiana. Phonetism here no longer aims at a delineation of subjects or symbols, but of the sounds by which these objects are conveyed to the mind. The first step in phonetic writing is, as we said, the syllabic, which by degrees becomes alphabetic. Difficult though it be in many instances to fix accurately the original ideographic meaning of many of the letters now in use, there is yet absolutely no doubt as to their having once been mere pictures of certain things to which a meaning was attached, the sound of which was in some shape connected with the present value of the letter. Our knowledge of Phœnician, whence our alphabet is directly derived, and of its cognate dialects, enables us, in many instances, to trace them back to their primitive source. Thus, our *A* was originally depicted as the head of an ox, a likeness to which may still be traced in its Phœnician form, and its name (Aleph = ox) has still survived in Hebrew and Greek (Aleph or Alpha). This process of the gradual change of a picture into a character is most clearly traceable in the various stages of Egyptian hieroglyphics, which, when written more cursorily, assumed such different shapes (in hieratic and demotic respectively), that often there remains scarcely a likeness between different forms of the same characters. Among the ideographic methods, there are some, however, which scarcely seem to deserve the name of writing, in the ordinary sense. Such are the Peruvian quippos, or knots, which, by changes in color, size, arrangement, and the rest, indicate a certain special sequence of ideas; further, the "kheruns" or sticks, which, before the introduction of their present alphabet, the Tartars used to circulate among their tribes, to indicate the number of men and horses to be used for some special expedition. Similar to the Peruvian quippos, was (according to the celebrated Chinese work, "I-king") also the primitive Chinese mode of writing; while the Scandinavian and Germanic runes rather remind of the Tartar staves. Of a more advanced stage appears the Mexican Pictus-writing, a system by which single syllables or words were expressed by phonograms. The Chinese system appears to combine both the ideographic and phonetic characters; but there is scarcely a doubt that even the phonetic signs are derived from ideographic ones. The step to the alphabetic system, however, was never taken by the Chinese.

When and how our present alphabet was invented, has been matter of speculation from the earliest times. The myths of antiquity ascribed it to Thoth (q. v.), or to Kadmus, which only denotes their belief in its being brought from the East (Kedem), or being perhaps primeval. The Talmud ascribes it to a special revelation. It has been a question whether there were several original alphabetical systems, or whether one is to be assumed as having given rise to the various modes of writing now in use. Thus, three principal sources—Semitic, Chinese, Indian—are given by Klaproth. It is, however, now agreed on all hands that it is the Phœnician character, as we now know it, to which we directly owe our own. See PHœNICIA. From it many streams have flowed out. The principal of these appear to have been—First, the Semitic, in which the values of the letters have remained almost identical with those of the original Phœnician, with exception, perhaps, of a few sounds added to them in Persian, for the purpose of expressing certain Indo-Germanic sounds not existing in Phœnician. This class has further been subdivided into Hebrew-Samaritan and Aramaic, the latter embracing the square or modern Hebrew, which is closely allied to the Palmyrene, the Estranghelo or Syriac, the Sabian, the Arabic in its different forms, the Mongol, the Pehlvi, the Armenian, &c. The second or central division embraces the writing of Greece, Asia Minor, and Italy, from the Æolo-Doric, Etruscan, Umbrian, Oscan, and other but little known kinds, to the late Pompeian Graffiti. A further group would include the "Indo-Homerite" characters, and seems to have originated in Central Arabia, whence it appears to have spread to Africa and India, where the Magadhi—the oldest variation the Phœnician assumed here—gave rise to the five families of Devanagari, Pali, Davidian, Occanian, and Tibetan.

Yet, when we speak of the Phœnician as being the mother of all our known alphabets, we must not be understood finally to ascribe to the Phœnicians the original invention of it in the first instance. We shall only indicate here that the theory to that effect, held by Gesenius and others, will probably, sooner or later, have to give way to the more recent results of De Rouge's investigations, who, with great

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show of probability, believes it to have been borrowed, or rather adapted from certain archaic hieroglyphics of Egypt. It would appear as if at some very archaic period the Phœnicians had borrowed the hieratic signs then in use; as, indeed, the "Priese Papyrus," the oldest in existence, exhibits striking similarities with the Phœnician characters. Instead, however, of simultaneously taking the Egyptian names for these characters they invented new ones according to their own fancy and to the supposed similarity of the characters to some particular thing. The Egyptian origin of the Phœnician character, if confirmed by further researches, would be a striking instance of the correctness of the tradition to that effect, which Tacitus has preserved ("Annal." xi. 14).

We have in the course of this work treated at full length several points of this subject. See **HIEROGLYPHICS**, **CUNEIFORM**, **ALPHABET**, &c. We may, therefore, for a fuller elucidation of the details, refer to those articles. We shall only add in this place that the manner of writing is very different with many nations. The Mexican picture-writing begins at the bottom; the Chinese and Japanese, as well as the Mongols, write in columns beginning from the top, and going from right to left. The Egyptian hieroglyphics have no fixed direction; but the hieratic and demotic, though the single letters are formed from right to left, always ran from left to right; as is also the case in Ethiopic, Cuneiform, and Indo-Germanic languages generally. The Semitic languages have retained the Phœnician mode of writing from right to left—all but the numerals—a mode still retained in archaic Hellenic and Etruscan. By degrees, however, the writer, not wishing to return to the beginning of the line, and continuing right underneath the last word penned, a double mode was introduced, called the *boustrophedon*—as the ox ploughs. Finally, this too was abandoned, and the direction from left to right was followed. About the many various styles of modification our characters have undergone in the course of time, the punctuation of the words, and the rest, we refer to **ALPHABET**. The materials used for writing were of the most different kind, as were also the instruments employed for the purpose. See **PAPYRUS**, **PEN**, &c.

WRITING FLUIDS. See **INK**.

WRO'NGDOER, in English law, as well as popular parlance, is he who commits some wrong for which an action may be brought to recover damages.

WRY'NECK (*Faux*), a genus of birds of the Woodpecker family (*Picidae*), having a short, straight, conical beak; a long extensile tongue, with a horny point; wings of moderate size; a rather short and rounded tail; the feet with two toes in front, and two behind. One species, the **COMMON W.** (*Y. torquilla*), is a summer visitant of Britain and the north of Europe. From its appearing at the same time with the cuckoo, it has acquired the name of *Cuckoo's Mate*. It is common in the south of England, but very rare in the northern parts of Britain. It is about seven inches long, of a rusty ash color, irregularly spotted with brown and black. It feeds on caterpillars and insects, and is often seen on the ground near ant-hills, feeding on the ants and their "eggs." The construction of its tongue resembles that of woodpeckers, and enables it to seize its insect prey with wonderful celerity; the tongue is darted out, and retracted, so that the eye can scarcely follow it; the two posterior branches of the bones of the tongue being much elongated, and muscles for its extension attached to them. There is also a long gland on each side of the lower jaw, which secretes a glutinous mucus, so that insects adhere to the horny tip of the tongue. The W. generally makes almost no nest, but deposits its eggs on fragments of decayed wood in the hole of a tree. The young birds are easily tamed, and are great favorites with boys. In France, it is common for boys to tie a string to one of the legs of the bird, and to allow it to climb trees in search of insects. It climbs readily on their clothes. The name W. is derived from the habit which the bird has of writhing its head and neck quickly in various directions, with an undulating snake-like motion, which it does particularly if found in its hole in a tree, making at the same time a hissing noise, so as to alarm the intruder; but on his drawing back, it suddenly darts out and escapes.

WUDWAN, a town of India, in the peninsula of Kattywar, province of Guzerat, 105 miles west-by-north from Baroda. It is situated on a small river, which falls into the great salt marsh known as the *Rana* of Oatch. Pop. (1873) 17,369. The

surrounding district is in a high state of cultivation, and is celebrated for the excellence of the cotton which it produces.

WULSTAN, or Wulfstan, and sometimes Wolstan, a name of interest in connection with Anglo-Saxon history and literature. There are three individuals of the name especially noticeable.—1. A monk of Winchester in the 9th c., author of a poem, in Latin hexameters, on the Miracles of St Swithin, which is reputed the best Latin poem of that age produced in England.—2. An Archbishop of York, in 1003, author of two pastoral letters and several sermons in Anglo-Saxon, the most remarkable of which is printed in Hicke's "Thesaurus," vol. iii.—3. The well-known Bishop of Worcester, and a saint of the English calendar. He was born at Icentum, in Warwickshire, about 1007, and educated at Evesham and Peterborough. He became a priest, afterwards a monk and prior of the monastery of Worcester, and ultimately, in 1062, bishop of that see. He lived through the troubles of the Norman Conquest, and enjoyed the favor not only of the Conqueror, but of William Rufus, and died in 1096, at the age of 87. He is by some reputed the author of the portion of Anglo-Saxon Chronicle which extends from 1064 to the death of the Conqueror.

WUPPERTHAL, a celebrated valley of Rhenish Prussia (q. v.), derives its name from the river Wupper, or Wipper, a small affluent of the Rhine, which rises between the towns of Wipperfurth and Hückeswagen, 26 miles north-east of Cologne. Its course is first north, then north-west, past Barmen (q. v.) and Elberfeld (q. v.)—the chief town on its banks—then south-west to its junction with the Rhine between Wiedorf and Rheindorf, 7 miles below Cologne, after a course of 60 miles. The waters of the Wupper are very abundant, and for the length of its course it supplies motive-power to an extraordinary number (about 400) of mills, of various kinds. It is navigable for small craft below Solingen (q. v.). The Valley of the Wupper is the most actively industrious and most densely peopled in all Germany. Coal is found in abundance.

WURNO, a town of the Háusa States, Central Africa, 18 miles north-east of Sokoto, on the Sokoto, a tributary of the Niger. It is extremely filthy—the small ravine which intersects the town forming a most disgusting spectacle. Barth expresses his astonishment at the quantity of cotton brought into the market, which shewed what the fine vales in the vicinity are capable of producing. The pop. is stated at from 12,000 to 15,000.

WÜRTTEMBERG, The Kingdom of, lies in 8° 15'—10° 30' e. long., and 47° 35'—49° 35' n. lat., is bounded on the w., s.-w., and n.-w. by the Grand Duchy of Baden; e., s.-e., and u.-e. by Bavaria; and s., for a few leagues, by the Lake of Constance and Vorarlberg. Hohenzollern makes a deep indentation into the land from the south, and the entire boundary is very irregular. Detached pieces of territory belonging to w. also lie in the adjacent countries. Its greatest length, from the village of Blumringen in the north, to the Lake of Constance in the south, is 199 miles; and greatest breadth, from the Katzenkopf, in the Black Forest, eastward to the castle of Duttensstein in Neresheim, 105 miles. The following table gives the pop., according to the census taken December 1, 1871, and the area in sq. miles (pop. in 1875, 1,881,506):

Circles.	Area in Square Miles.	Population (1871).
The Neckar.....	1295	546,760
" Black Forest.....	1843	448,160
" Jügel.....	1908	884,714
" Danube.....	2413	426,915
Total	7459	1,818,539

Since 1867, the population had increased, in the Neckar Circle, 47 per 1000; in the Danube Circle, 52 per 1000; and in each of the other two, 7 per 1000.

The capital of W. is Stuttgart (q. v.), and there are three other towns in the

kingdom with a pop. above 11,000—viz., Ulm, Heilbronn, and Esslingen. The various districts have no natural capital, and Stuttgart has no rival as to pop. or importance.

Physical Aspect.—The surface of W. is composed of terraces of hill and dale, the lowest point being 420 feet above the sea. In the Black Forest Circle the mountains attain the highest elevation, the Hornsgründe rising above 3700 feet. One point of the Swabian Alps is nearly 3000 feet high. The valleys and plains average 600 feet above the sea. Rich pastures, cultivated fields, orchards, gardens, hills covered with vines, and mountains with forests, give the most diversified scenery. In the south-west are extensive peat-lands.

Rivers, Lakes, &c.—The most important rivers are: the Neckar (q. v.), with its affluents; the Danube, which receives the Iller; and the Tauber, a tributary of the Main. The Neckar and its streams drain 4200 sq. m.; the Danube, 2037; the rivers which fall into the Lake of Constance, 714; the Tauber, 815; and other water-courses, 168 sq. miles. The only lake in the interior is the Federsee, near Buchau, in the Danube Circle. There is much traffic both by steam and sailing ships on the Neckar, and from Friedrichshafen, on the Lake of Constance.

Railways have been constructed to the extent of 780 English miles, from Bruchsal to Ulm, Ulm to Friedrichshafen, Bietigheim to Hall, Cannstatt to the Bavarian lines, and from Plochingen by Tübingen and Rottweil into Baden and on to Schaffhausen. There were, in 1871, 445 post-offices, which forwarded 14,900,000 private letters, about 4,000,000 official letters, and near 21,000,000 newspapers. The postal income in 1875 was 4,919,400 marks, the expenditure about 200,000 marks less. Of telegraphs, there are 1600 miles in operation.

Geology, Mineralogy, &c.—The prevailing rocks are granite, gneiss, limestone, and various sandstones. Tourmaline, cobalt, bismuth, silver, malachite, chalcodony, gypsum, copper, rock-crystal, and iron occur. A great variety of fossils have been found. The peat-lands are extensive, and yield annually 460,000 florins. Fire-clay of excellent quality, earthen for dyeing, and native sulphate of lime, are worked. Building materials, from the granite of the Black Forest to the tufa of the Alb Valley, abound. Clay-band ironstone, yielding from 80 to 36 per cent. of iron, is worked in eleven different districts, and salt in five. The annual value of mineral products is about £200,000. In 1874, 16,816 tons of iron were produced, valued at £26,118. There are many springs of mineral water, those of Cannstatt and Stuttgart being much frequented.

The climate is mild and healthy, but in the highlands the winters are long and cold. When west winds prevail, the cold of winter and summer heat are less than in some countries in the same latitude. The greatest quantity of rain falls in summer. Of the total area about 25 per cent. is occupied by plains or level ground, 46 per cent. is hilly, and 29 per cent. mountain land. The soil is for the most part very fertile and well tilled. The vineyards are chiefly in the Neckar Circle and that of the Jagst. The forests, grain, and pasture lands are nearly equally distributed throughout all the circles. Wheat, oats, barley, rye, potatoes, beans, maize, turnips, mangold-wurzel, lucerne, &c., are the principal agricultural products. There are extensive orchards in all parts of the land. Cherries, damsons, walnuts, peaches, apricots, and the more common fruits, are largely grown. Timber is largely grown and exported, especially from the Black Forest regions. Large and small cattle are plentifully reared. Large cattle, which in W. are generally fed in the stall, constitute the principal export of W. to Switzerland and neighboring lands. Forestry and the various branches of agricultural science are diligently promoted by numerous technical institutes.

Manufactures, Industries, &c.—The manufactures are chiefly linen, woollen, cotton, and silk fabrics. Wool and cotton spinning, bleaching, dyeing, printing, iron-founding, making machinery, cutlery, gold and silver articles, glass, porcelain, earthenware, tile, cabinet-work, sawing wood, carriage-building, grinding corn, book-printing, and the cognate trades are principal industries. There are many oil-mills, beer-breweries, and brandy distilleries. Water is to a large extent the motive-power employed in the manufactories and mills. In W., more than 215,500,000 bottles of beer, or 125 for each person, are consumed yearly, besides wine, brandy, and liquors. The total value of land, houses, railways, movables, &c., is reckoned at 2710 million florins, and the income of the people at 276,000,000—140,000,000 being from land produce, 181,000,000 from the industries, and 5,000,000 from interest on foreign funds.

The exports are chiefly grain, cattle, wood, salt, oil, leather, woollen, cotton, and linen goods, beer, &c.

Religion, Language, Education, &c.—The population of Old Württemberg is almost entirely Lutheran. The numbers of each denomination in 1871 will be seen in the subjoined table:

Circles.	Evangelical Lutherans.	Roman Catholics.	Other Christians.	Jews.
The Neckar	497,826	44,890	2,250	4,227
" Black Forest.....	829,960	116,131	746	1,528
" Jagst	264,419	115,763	459	4,024
" Danube.....	156,595	377,290	372	2,666
Total.....	1,249,860	538,542	8,857	12,245

Of 1,798,160 marks set apart in the budget of 1875—1876 for "Church and School," a great part was expended on the support of the various religious bodies.

Several dialects of German are spoken, of which the Swabian and Franconian are the most general. W. has been the native country of many distinguished men, of whom a few may be mentioned. In poetry: Schiller, Uhland, Wieland, Kerner; in theology and philosophy: Brentz, Oecampadius, Bengel, Schelling, Hegel, Baur, Strauss, &c.; in science and art: Kepler, Stiefel, Tobias Mayer, the botanists Joseph and Karl Friedrich Gärtner, the chemist Schönbein, the painters Eberhard Wächter, Hetch, and the famed sculptor Dannecker.

Every child between 7 and 14 years must attend school. In a district having 80 or more families, is a public school, and a teacher for every 90 children. There are four Protestant theological seminaries, with a course of four years; gymnasia, grammar, trades, and high schools in all the principal towns. The university at Tübingen has 80 ordinary and extraordinary professors and tutors. The number of students varies from 700 to 850, of whom 200 to 300 are foreigners. At Heilenheim is an agricultural and botanical institution, in which farming, management of forests, and gardening are scientifically taught. Stuttgart has a polytechnic school, which is one of the best institutions of the kind in Germany. The government outlay on education amounts annually to nearly 1,000,000 marks.

Revenue, Expenditure, &c.—For the year 1875—1876, the revenue was 44,837,367 marks, which just covered the expenditure. The civil list and appanages amount to 2,101,783 marks; interest of the national debt, 15,892,766 marks. Of the income, 21,920,965 marks came from public property, and 20,008,940 marks from direct and other taxes. The railways yielded 11,520,000 marks, and the post-office 177,125 marks of clear revenue. The troops of W. form the 18th corps d'armée of the German empire.

Government, &c.—The crown is hereditary in the male line, and failing that, in the female. Freedom of the press and religion are enjoyed. The privy-council consists of a president, the six ministers of state, and members named by the king. The legislative body is composed of two chambers—the first being formed of princes of the royal family, nobles, and members appointed by the king, the last named not exceeding a third part of the whole; the second chamber is composed of 18 representatives of the knighthood, 6 Protestant general superintendents, the bishop and two others of the Catholic clergy, the chancellor of the university, 7 representatives from the cities Stuttgart, Tübingen, Ludwigsburg, Ellwangen, Ulm, Heilbronn, and Reutlingen, with a representative from each of the 64 bailiwicks. Members of the second chamber are not eligible as such before reaching their 30th year. The king has the power of proroguing or dissolving the chambers; but in the latter case, a new election must take place within six months. As a member of the re-constituted German empire (1871), W. has four votes in the Federal Council, and 17 representatives in the Diet of the empire.

History.—The earliest inhabitants of W. were probably Celts; but when the Romans came first to know the country, it was held by the Suevi, who were succeeded by the Alemanni and the Franks. In 1090, Conrad, Count of Württemberg, possessed a castle near Osnustatt, and limited territories, which were largely added

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to by Ulrich I. from 1245 to 1265. Other extensions were gained by Eberhard I. between 1279—1295; by Ulrich II., who, though a man of peace, added Tübingen; Eberhard II., who secured Teck, Gütenberg, Kirchheim, Herrenberg, and other places. By the marriage of Eberhard IV. with the Countess of Montbéliard, that county became connected with Württemberg. At his death, the possessions were divided between his two sons, each of whom enlarged his portion; and a few years after their death, Eberhard V. secured a reunion, and the land advanced rapidly in power and importance. In 1495, the Emperor Maximilian raised Eberhard to the rank of Duke, with the title of Eberhard I. In 1519, Duke Ulrich having offended the Swabian League by some arbitrary acts of oppression exercised upon the imperial free city of Reutlingen, he was forcibly ejected from W., and did not reconquer his estates till 1534. While Eberhard III. was Duke (1628—1674), W. suffered much in consequence of the Thirty Years' War. Ludwig Eugene (1722—1795) having taken part in the war against the French Republic, a French army attacked and compelled him to resign Montbéliard, and pay 8 600,000 francs.

With Duke Frederick II., who succeeded his father in 1797, the most important period in the history of W. begins. In 1800, compelled by the French to flee from his dukedom, he got back, by the Peace of Lunéville, all his territories except Montbéliard, and instead, had others granted, with the rank of Elector. Having aided Napoleon in the war against Austria, at the Peace of Presburg (26th December 1805), W. was further enlarged, and made a kingdom. After the battle of Leipzig, Frederick abandoned the cause of Napoleon, and concluded a treaty with Austria, in which his lands were guaranteed. His reign was arbitrary; and internal troubles were thickening around him, when he died (30th October 1816), and was succeeded by his son, William I., who was born at Lubin, in Silesia, 27th September 1781. He was cordially welcomed to the throne, and the expectations of his subjects were realised. His first acts were to reduce the expenditure, and introduce other reforms, prominent among which was the liberal constitution of 1819. In 1849—1850, a strong agitation was kept up with the view of obtaining some permanent modifications in this constitution, but without success. For nearly 50 years he reigned over a people steadily increasing in prosperity, and died 26th June 1864, at Rosenstein Castle. His son, Charles Frederick Alexander, now Charles I., born March 6, 1822, succeeded him. See GERMANY.

WÜRTZBURG, a former sovereign bishopric or ecclesiastical principality of the German Empire, was founded in 741 (according to other accounts, 743 or 746), and received endowments from the Frankish kings, which were afterwards increased by the German emperors. The first bishop was Burkhardt, who was consecrated by Boniface. The patron saint was Kilian (q. v.), who is said to have preached the gospel here as early as 688. By good management and economy, the bishops were able to acquire numerous possessions of the neighboring Frankish proprietors; and out of these was gradually formed the extensive sovereign bishopric of W., ruled over by the prince-bishop as Duke of Franconia. The ducal title and authority were first conceded about 1120. In spiritual matters, the bishops were under the Archbishop of Mainz. The area of the bishopric was as much as 1897 sq. m., with a pop. of 250,000, and a yearly revenue of 500,000 gulden. At the Peace of Lunéville (1801), the bishopric of W., like the other spiritual principalities of Germany, was secularised; and in 1808, the greater part of it was conferred on the Elector of Bavaria as a secular principality. The last prince-bishop received a pension, and died at Bamberg in 1808. At the Peace of Presburg (1805), Bavaria gave up W. to the Grand Duke Ferdinand of Tuscany, and the principality was raised to the dignity of an electorate. In 1806, the Elector Ferdinand joined the Confederation of the Rhine, and from that time took the title of Grand Duke of Würzburg. By a decree of the Vienna Congress, the grand duke received his hereditary state of Tuscany, and W. reverted to Bavaria. At present, the greater part of the bishopric belongs to the circle of Lower Franconia.

WÜRTZBURG, capital of the former principality of Würzburg, now of the Bavarian circle of Lower Franconia, is situated in a beautiful valley on both sides of the Main, over which there is a stone bridge 600 feet long, of eight arches. The number of inhabitants amounts to (1871) 41,008, of whom 6200 are Protestants. Among the public buildings, the most distinguished are the Episcopal Palace or Residence, rebuilt in 1730—1744, one of the most magnificent royal residences in the

world; and the spacious and excellently fitted-up Julius Hospital, established in 1576. Of the numerous churches, the most worthy of notice are the richly-decorated cathedral, which was rebuilt in the 11th and following centuries; the Marien-Kapelle, one of the most beautiful monuments of old German art, with 14 statues of the 15th c. by Tilmann Riemenschneider; and the Neumünster Church, containing the bones of St Kilian. The streets adjoining the Palace Square are wide and straight, but most of the others are narrow and crooked. In front of the Julius Hospital there is a bronze statue of the founder, Bishop Julius, by Wiedemann, founded in bronze by Miller; a monument of Walther von der Vogelweide (q. v.) stands in a niche outside the Neumünster Kirche.

The university of W. was founded in 1527 by Bishop Julius, who also founded the hospital above mentioned. The endowments for both institutions were taken from the possessions of the convents that were destroyed during the Peasant War (q. v.). In order to promote the study of medicine, the hospital was put in connection with the university, the professors of medicine being made physicians and surgeons to the hospital; this connection has all along kept the medical faculty in high repute, and promoted the prosperity of the university as a whole. The present medical staff includes several names of European reputation, among others, Kükler (q. v.). All the professors of the theological faculty are thoroughgoing infallibilists. There is also a faculty of political economy. In the summer session 1875, there were 361 matriculated students. The library contains above 100,000 vols. In the Musical Institute, any one can receive instruction gratis in singing or in playing on any instrument; and twice a week there are great musical pieces performed. In W., besides the university, there is a gymnasium, a Latin school, a district agricultural and trade school, a seminary for Catholic priests, and a seminary for training teachers, an orthopedic institution, a veterinary school, a school for midwifery, a swimming school, a society for the improvement of the arts and manufactures, and a female society for the encouragement of skill in arts and handicrafts among women. Besides the Julius Hospital, there are asylums for the deaf and dumb and for the blind, and other charitable institutions. The manufactures are woollen stuffs and cloth, mirror-glass, leather, tobacco, railway carriages, and sparkling wines. The fortress of Marienberg, built on the site where Drusus founded a castle, is situated on a hill 400 feet high on the left bank of the Main, outside the town. The campaign of the Prussian army of the Main ended with an action fought before W. 31st July 1866. The fortifications have been demolished. The industry of W. has greatly prospered during the last ten years.

WURZEN, a small walled town of Saxony, 15½ miles east of Leipzig, picturesquely situated and surrounded by romantic valleys, on the Mulde, here crossed by two bridges. Pop. (1871) 7856, employed in brewing, bleaching, weaving, and hosiery-work. It is a station on the Leipzig and Dresden Railway.

WYANDOTS, a tribe of North American Indians, of the Iroquois family, the Harons of the French writers, who called themselves Wendats or Yendats, first known at Montreal, where, in the middle of the 17th c., they became Roman Catholics under the instructions of the French Missionaries. Having, as allies of other tribes, become involved in a war with the Iroquois, they were nearly exterminated, and the remnant emigrated to the country around Lake Superior; then gathered at Mackinaw, 1670, under the care of Father Marquette, thence came to Detroit, where they furnished 400 warriors to the English in 1812. In 1829, they were settled to the number of 600, on the head-waters of the Sandusky River in Ohio; and in 1832, by a treaty with the United States government, removed to Kansas, where the few remaining have acquired the rights of citizenship, each having of their divided lands a farm of 40 acres.

WYATT, Richard John, an English sculptor of great eminence, was born in Oxford Street, London, on the 8d of May 1795. He belonged to a collateral branch of the family which made the name of Wyatt famous during two centuries, in connection with architecture and sculpture, sharing their descent from a stock of yeomen long settled at Weeford in Staffordshire. Having the bias of his family towards art, he became an articled pupil of Charles Rossi, R. A., sculptor, and afterwards a student of the Royal Academy, whose medal was twice awarded to him during his pupilship. He afterwards passed some time in Paris, studying under Bosio; and from

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Parl., in 1821, he went to Rome and entered the studio of Canova, where he had Gibson for a fellow-pupil. The remainder of his life was spent in Rome, in complete devotion to the prosecution of his art; and he died at Rome on the 29th of May, 1850. His youth had shewn great promise, in the estimation of painters like Lawrence and sculptors like Canova; and the works which he produced in rapid succession, early placed him in the front rank of English sculptors. Several of his works were shewn at the Great Exhibition of 1851, and the medal for sculpture was awarded to him, though he had died in the previous year. Living only for his art, he labored at it incessantly—often, it is said, from dawn till after midnight; and the number of his works is very great. Elegance and refinement, singularly combined with animation and finish of workmanship, are his characteristic merits, but his works also disclose a lively and graceful invention. His favorite subjects were classical and poetical. His most admired productions are in England, and casts from several of them are to be seen at the Crystal Palace. He was not admitted to the honors of the Academy, a by-law of that institution confining its membership to artists resident in England.

WYATT, Sir Thomas, was born in 1506, at Allington Castle in Kent. His father, Sir Henry Wyatt, of a family originally of Yorkshire, stood high in favor with Henry VII.; and not less so with Henry VIII., who succeeded him. In 1515, the young W. was entered at St John's College, Cambridge, where in due time he took his degrees of Bachelor and Master of Arts. Whilst still very young, he was married to Elizabeth Brook, daughter of Lord Cobham. Through his father's influence, a career at court was open to him. In this sphere he was thoroughly well qualified to succeed; he was one of the most accomplished men of his day; of a noble presence and fine manners, and withal dexterous and subtle in the management of affairs, though of unimpeached honor and integrity. In 1536, he received at the hands of the king the honor of knighthood; and the next year he was made high sheriff of Kent. Though necessarily involved in much perilous court intrigue, he continued—though once or twice in some hazard of losing it—to retain the favor of the king, and was frequently employed by him in positions of trust and importance. His chief service was rendered as English ambassador at the court of Charles V., in which capacity he acquitted himself with much diplomatic tact and skill. In 1542, in token of the king's appreciation of his services, he received a grant of lands, at Lambeth; and the year after, he was named high steward of the king's manor at Maldstone. He had now very much withdrawn himself from public life, and lived for the most part retired at Allington. On the 11th of October 1543, he died at Sherborne, of a fever contracted, it is said, on an overhasty journey caused by a sudden summons to attend the king.

Among the other accomplishments of W. was that of verse, which he seems to have begun to cultivate early, and continued through life to practise. During his life, he had acquired considerable reputation as a poet; and in 1557, his poems, along with those of the celebrated Surrey, were published in London. As marking a stage in the progress of our early literature, they hold a permanent place. His love poetry is somewhat overrun with conceits derived from the study of Italian models; but some of the shorter pieces are models of grace and elegance. His satires also possess very considerable merit. More lately, in 1815, an edition of his works, in two volumes, was published in London.

WYATT, Sir Thomas, surnamed "the Younger," to distinguish him from the preceding, of whom he was the only son, was born about 1590. After a wild and riotous youth, he raised a body of men at his own expense, and did good service at the siege of Landrecies (1544), displaying considerable military talent; and continued in honorable service on the continent till 1560. In 1554, when the Spanish match was in agitation, W. joined the Insurrection, and led the Kentish men to Southwark, after gaining considerable successes over the royalists; but failing to capture Landgate, he became separated from the main body of his followers, and was taken prisoner, and soon after executed, 11th April 1554.

WYCHERLEY, William, a comic dramatist of the period of the Restoration, was born at Clive, near Shrewsbury, in 1640. His father, a cavalier squire of £800 a year, sent his son to France at the age of 16; and during his residence on the banks of the Charente, the youth was a favorite at the court of the governor of Angoulême,

whose accomplished wife, the Madame Rambonillet of Voltaire, converted him to the creed of the Church of Rome. On his return to England in 1660, W. studied a short time at Oxford, where he was reconciled to the Anglican Church, and he was entered of the Middle Temple. His first comedy, "Love in a Wood," was acted with great applause, and published in 1672, and it was followed by three other successful comedies, "The Gentleman Dancing-master," 1673; "The Country Wife," 1675; and "The Plain Dealer" (his best work), 1677. About 1680, the dramatist was married to a young and rich widow, the Countess of Drogheda, whom he had met at Tunbridge. The lady was distractedly jealous of him, kept him from frequenting the court, which lost him the favor of the king, and watched him closely wherever he went. She did not live long, and she left him the whole of her fortune; but his succession to the estate was disputed, and an expensive lawsuit ensued, the costs of which, added to personal debts, fairly broke down the unlucky dramatist. He was committed to the Fleet, and suffered to languish there neglected for seven years. He was partly relieved by the bounty of James II.—probably because he returned to the communion of the Church of Rome—and he succeeded to the patrimonial estate in Shropshire by the death of his father. This did not, however, much relieve him, as the estate was heavily mortgaged, and strictly entailed. He was on bad terms with the heir-at-law, his nephew; and on purpose to injure this relative, W., at the age of 75, married a young girl, on whom he settled a jointure; and eleven days after this transaction—the last and perhaps the most scandalous act of his life, as Macaulay describes it—the old dramatist died. His death took place in December 1715, and he was interred in St Paul's Church, Covent Garden. Besides his comedies, W. published a volume of wretched "Miscellany Poems," 1704; and another volume, partly consisting of "moral reflections," was published after his death. The comedies of W., on which his fame rests, reflect the literary taste, the manners, and vices of the times in which he lived. They are, in truth, grossly immoral and profligate. They have, however, some literary excellence. The language is clear and forcible, the dialogues often witty and lively, some of the characters vigorously drawn, and the observations and maxims scattered throughout the different scenes are shrewd and sensible, and expressed in a terse sententious style. W. was the founder of that school of artificial comedy which Congreve, Farquhar, and Sheridan carried to its highest perfection, imparting to it an airy grace and brilliancy far above the reach of its first master.

WY'COMBE, Chipping or High, a municipal and parliamentary borough in Bucks, surrounded by beech-clad hills, 28 miles west-north-west of London, on the Wye, a small affluent of the Thames. The church of All Saints is a large and handsome building, erected in 1773; it is in the Norman and early English style of architecture, and consists of a body and two isles, and, with the chancel, is 180 feet long. The tower is 96 feet high, and was built in 1592. There are corn and paper mills on the Wye; beech-wood chairs are made here, and lace-making is carried on. At two miles distance is the village of West Wycombe. Since 1867, the borough returns one member to parliament. It is connected with the Great Western Railway. Pop. (1871) of municipal borough, 4811; of parl. borough (which includes Chipping Wycombe townships), 10,492.

WYE, a river of England, of great picturesque beauty and considerable importance, an affluent of the Severn, has its origin in two copious springs which issue from the south-east side of Philipmon, not two miles from the head-water of the Severn (q. v.). It flows in a south-easterly direction through Montgomeryshire and Radnorshire, forming the south-west and south boundary of the latter, east-south-east to the middle of Herefordshire, and then south, dividing in its lower course the county of Monmouth from that of Gloucester, and entering the estuary of the Severn below Chepstow. Length of course 180 miles, for 70 miles of which to Hereford it is navigable for barges, though large vessels cannot ascend above Chepstow Bridge. At Chepstow (q. v.) the tide rises higher than at almost any other place in Great Britain. The chief affluents of the W. are the Lug and Ithon on the left, and the Monnow, the Caerwen, and Iffron on the right. The part of the river which separates Monmouth from Gloucester is that chiefly visited for its singular beauty.

WYKEHAM, William de, was born at Wickham, in Hampshire, in 1294. He was educated at Winchester. On October 8, 1366, by the king's recommendation, he was elected Bishop of Winchester. He was consecrated October 10 of the year

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Wyrvern

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following. Meanwhile, he had been appointed Lord High Chancellor of England; in which office he was confirmed September 17, 1367. He resigned on March 14, 1371, on a petition being presented to the king against the government remaining too long in the hands of men connected with the church. He now devoted himself to various objects of lasting usefulness. His preparatory college or school at Winchester was opened for teaching in 1373; but the building of the college was not begun till 1387. It was finished in 1393. In the college which he instituted at Oxford, teaching had also begun in 1373; but the building of "St Mary's College of Winchester in Oxford" was not begun till 1390; it was finished in 1393. He began the rebuilding of Winchester Cathedral in 1395, and just lived to see it finished. Meanwhile, he had become the object of resentment to the Duke of Lancaster and party, at whose instance he was indicted for pecuniary defalcation, and other crimes alleged to have been committed by him as Keeper of the Privy Seal and Lord Chancellor. He was heard in 1376 before a commission of peers, bishops, and privy councillors, declared guilty, and a severe sentence was passed upon him. It was, however, ultimately commuted into a fine, which was remitted on the accession of Richard II. in 1377. He was one of the council of 14 appointed to the king in 1396, and in May 1399 he was again made Lord Chancellor. He continued in office till September 27, 1391, when he resigned; and from this date he appears to have taken little active part in public affairs. He was present in the parliament held on September 30, 1399, when Richard II. was deposed. He was also present in the first parliament of Henry IV. He died at South Waltham, September 27, 1404.—See "Life" by Dr (afterwards Bishop) Lowth (Lond. 1754). W. of Wykeham was one of the most munificent benefactors of the English Church; but he was not a fanatic. He loved learning, order, civilisation, and purity of manners; and as Bishop of Winchester, signalled himself by his rigorous reformation of ecclesiastical abuses; but he had not the slightest tendency towards *Protestantism*, affording, in this respect, a most striking contrast to his contemporary Wickliffe (q. v.). W. of Wykeham may be taken as the type of a class of English churchmen both before and after the Reformation—men who are destitute of zeal on questions of doctrine, but zealous for the dignity, culture, and practical efficiency of the church.

WYNTOUN, Andrew, an old rhyming Scottish chronicler, lived in the beginning of the 15th c. Except that he was prior of the monastery of St Serf on Loch Leven, and wrote "The Orygynale Cronykil of Scotland," well known and valued by students of that kind of curious literature, almost no information regarding him has been preserved. Though with the usual proportion of extravagant fable, his work is not without considerable historical importance; while philologically it has a very distinct value, as a specimen of the old Scotch, then as nearly as might be identical with the contemporary dialect of England. The "Orygynale Cronykil" consists of nine books or cantos, of which only the last four are devoted to Scottish history; the first five giving a fragmentary outline of the history and geography of the ancient world. From his quotations, W. seems to have been a well-read scholar for his time. His style is not essentially different from Barbour's, and his versification is the same—the pleasant octo-syllable. In 1796, a splendid edition of this work was published by Mr D. Mucpherson; and this edition has been revised and enlarged by D. Laing, LL.D. (3 vols. 1872; vol. 3 has not yet appeared).

WYO'MING, a territory of the United States, formed in 1868, with an area of 97,883 square miles, lies between 40° and 45° n. lat., and 104° and 110° w. long. Its boundaries are—n., Montana; e., Dakota and Nebraska; s., Colorado; s. w., Utah; w., Idaho. It is a very mountainous region, elevated from 2500 to 8000 feet above the sea-level. The chief ranges are the Wind River range of the Rocky Mountains, in the w.; the Big Horn Mountains, near the centre; and the Black Mountains, in the n. e. The Missouri, Columbia, and Colorado have their source within this territory; and other important rivers are the Green River in the south-west, a fork of the Platte in the south-east, and in the north-west the Yellowstone (q. v.). The Laramie Plains in the s. form a tableland of 7000 square miles in extent. The soil of the valleys is moderately fertile, and there is good pasturage. W. is rich in minerals, which embrace iron, copper, lead, coal, silver, and gold. Mineral springs abound. Population (1880) 20,789. Cheyenne, the chief city, is connected by railway with Denver. The Union Pacific Railway traverses the s. of W.

WYOMING VALLEY, a beautiful, fertile valley on the Susquehanna River, in Pennsylvania, U. S., 21 miles long by 8 wide, surrounded by mountains 1000 feet high, its name supposed to be a corruption of the Indian *Maughwauwame*—large plains. It was purchased about 1765 by a Connecticut company from the Delaware Indians; but the settlers were soon dispersed by hostile savages. In 1769, 40 families came from Connecticut, but found a party of Pennsylvanians in possession, and for several years there were continual contests of the settlers with the Indians, and with each other. The Connecticut colony finally succeeded, and their town of Westmoreland had 2000 inhabitants. In 1776 they armed for their own defence against the English and their Indian allies; but in 1778, most of their troops were called to join the army under Washington. June 30, a force of 400 British provincials, or "Tories," and 700 Seneca Indians, led by Colonel John Butler, entered the valley, and were opposed by 300 men, under Colonel Zebulon Butler. On July 3, the settlers were driven to the shelter of Fort Mifflin, with the loss of two thirds of their number, many soldiers and inhabitants being murdered; a half-breed Indian woman, called Queen Esther, having, in revenge for her son's death, tomahawked fourteen with her own hand. On the 5th, the remnant of the troops surrendered, and they and the inhabitants were either massacred or driven from the valley, which was left a smoking solitude. Campbell's "Gertrude of Wyoming," founded upon the stories of this disaster, contains exaggerations and misstatements, notably that of attributing the leadership to Brandt, who was not in the expedition. The disputes between the Connecticut and Pennsylvanian settlers were not finally settled till the commencement of this century. The valley is now one of the most flourishing districts in the state.

WYVERN, a fictitious monster of the middle ages, frequently occurring in heraldry. It resembles a dragon, but has only two legs and feet, which are like those of the eagle.

X

X, the last letter of the proper Latin alphabet, and the last but two of the English. It is in reality a superfluous character, being equivalent in English, as it was in Latin, to *ks* or *gs*. In form, it corresponds to the Greek χ , but in power to Greek ξ . It was a later addition to the Latin alphabet, having been introduced, according to Corssen, between the time of the Decemvirate and the fall of Vell. Some Roman scholars did not acknowledge the character, but wrote *cs*, *gs* instead; and this substitution frequently occurs in inscriptions (e. g. *ucsoit*, for *uxoit*). At one period of Roman literature, *xs* was often written for *x*; e. g., *saxum*, *lexa*. In the popular pronunciation, the guttural element of the character gradually disappeared, until, in the later period of the Empire, *x* was undistinguishable from *ss* or *s*; thus, inscriptions shew *visit* for *visit*, *miles* for *miles*. This change survives in modern Italian, which substitutes *ss* or *s* for the Latin *x*, as *sasso*=*saxum*; *straneo*=*extraneus*; and uses *s* only in foreign words. In Spanish, in the beginning of words, *x* has a guttural sound, something between *ch* and *y*. In German, the use of *x* is mostly confined to foreign words; in native words the sound is usually represented by *ch*, as *wachsen*, to wax or grow, though some write, e. g., *achse* for *achse*.—In Algebra, *x* is the usual symbol for the unknown quantity which is to be determined.

XANTHINE and **XANTHINE** OF FLOWERS. The coloring matters of various flowers have been carefully examined by Frey and Cloez, who believe that the various tints may be referred to three distinct substances, of which one is of a blue or rose color, while the other two are yellow. These pigments have received the names of *Cyanine*, *Xanthine*, and *Xanthine*; the first being derived from the Greek *kyanos*, sky-blue; and the last two from *xanthos*, yellow. None of these substances have, however, been extracted in a pure condition, and hence nothing definite can be stated regarding their composition or properties.

XANTHINE, or **XANTHIC OXIDE** ($C_{10}H_4N_4O_6$), was first described by Dr Marcat, who regarded it as a very rare constituent of urinary calculi, and from its composition he gave it the name of *uric oxide*. During the last ten years, it has been proved to be a normal ingredient (although to a very small amount) of human urine, and has been found in the brain, the spleen, the pancreas, and the liver of the ox; in the thymus gland of the calf; and in the muscular tissue of the horse, the ox, and of fishes; as well as in the liver of various animals. Calculi composed of this substance are extremely rare, the total known number obtained from the human subject being less than half a dozen. They are of a light-brown cinnamon color, assume a waxy appearance when rubbed, and consist of concentric layers easily separable from one another. *Xanthine* occurs in such very minute quantities in the various tissues, and in so rare an ingredient of calculi, that it is unnecessary for us to enter into any description of its properties, further than to state that, when dried, it exists as a yellowish white powder, which assumes a glistening appearance when rubbed, and exhibits no signs of crystallisation under the microscope; moreover, the chemical difficulties of detecting traces of this substance are so great, that we shall not attempt to describe its tests. It seems to be intermediate to uric acid and hypoxanthine, both in a chemical and a physiological point of view. The composition of uric acid is represented by the formula $C_{10}H_4N_4O_6$, that of xanthine by $C_{10}H_4N_4O_5$, and that of hypoxanthine by $C_{10}H_4N_4O_4$. The former two occur simultaneously, not only in the urine, but in the spleen, the liver, and the brain;

while xanthine is not only invariably accompanied by larger or smaller quantities of hypoxanthine, but the latter can be made by the oxidizing action of nitric acid to yield a product from which xanthine (in place of hypoxanthine) may be obtained by a process of reduction. Xanthine must be regarded as a higher stage of oxidation of hypoxanthine, and a product of the regressive metamorphosis of the tissues, which, in the ordinary condition of the system, is excreted in a more highly oxidized form of urea, uric acid, &c.

This substance is stated to have been found by Göbel in some oriental bezoars, extracted from the intestines of certain ruminating animals. It is most probable that the supposed bezoars were in reality urinary calculi.

XANTHI'PPÊ, the wife of Socrates, has acquired the reputation of having been an arch-terminant, doubtless not without some foundation. It ought, however, to be remembered that her naturally infirm temper must have been not a little tried by the small concern manifested by Socrates in the regulation of his domestic affairs, which appears occasionally to have made it difficult for X. to "make both ends meet." Socrates himself, it is known, had completely mastered his naturally strong appetites and passions, and had acquired a temper of perfect serenity. It is quite natural, then, that contrast-lovers and story-mongers should, as a foil, match so great a practical philosopher with a woman of such an ungovernable temper as X. is said to have been. She herself, if we can trust Plato, appears to have really loved her husband, and he at his death committed her tenderly to the care of his friends. Many stories are told of her, as of every other notable character in history, to illustrate her peculiar tendency, but it is difficult to say how much credit ought to be given them.

XANTHORRHÆ'A. See GRASS TREE.

XANTHOXYLUM, a genus of trees and shrubs, the type of the natural order *Xanthoxylaceæ*, an order closely allied to *Rutaceæ*, and chiefly distinguished from it by unisexual flowers, including more than 100 known species of trees and shrubs, having opposite simple or pinnate leaves with pellucid dots, and no stipules, chiefly natives of warm climates, and more particularly of the warm parts of America. The order is generally characterised by pungent and aromatic qualities, which are strongly developed in the genus X. itself. *X. fraxinum*, a North American species, a very low, deciduous tree, with leaves somewhat like those of the ash, common from Canada to Virginia, is called TOOTHACHE TREE, from the use made of the hot acrid bark and capsules for the relief of toothache. It is also in high repute in the United States as a remedy for chronic rheumatism, for which it is administered in the form of a powder in doses of from ten grains to half a drachm three times a day. Some of the species are popularly called PEPPERS in their native countries, as in India and Japan, where they are used as a substitute for pepper. The bark of *X. fraxinum* is a powerful sudorific and diuretic, and other species possess similar qualities; some are febrifugal, and the seeds and unripe capsules of some are gratefully aromatic.—To the order *Xanthoxylaceæ* belong the AILANTO (q. v.) and the WHITE IRON-WOOD (*Vepris undulata*) of the Cape of Good Hope, the wood of which is very hard and tough, and is much used for agricultural implements.

XANTHUS, the name of the capital of the ancient Lycia, anciently called Arina, a city of the Tramilia, or Solymi, the primitive inhabitants. It lies at the south-west corner of Asia Minor, and near the village of Kounik. From the earliest historic times to that of Cæsar, the Lycians appear to have been independent under native rulers; but after the fall of Sardis and the capture of Cæsar, the Persian conqueror Cyrus sent an army for the conquest of Lycia, led by Harpagus, in 546 B.C. The most desperate resistance was made by the Lycians, and the people of X. burned themselves in their citadel, rather than surrender to the conqueror, only 80 families surviving the catastrophe. Reduced to a Persian satrapy, they sent 50 ships to the expedition of Xerxes against Greece, and contributed to the revenues of Persia. Little is known of the history of this town till the days of Alexander the Great. Alexander took X., which is said to have made as determined a resistance as it did on the former occasion. In the war which ensued amongst the successors of Alexander, Ptolemy took X. from the garrison of Antigonus; and the city subsequently passed into the possession of the Ptolemies and Seleucids. After the defeat of Antiochus, it was ceded by the Romans to Rhodes,

but subsequently had its liberties restored. In the civil war between Brutus and the Triumvirs (43 B.C.), X. was taken by Brutus. The inhabitants a third time destroyed themselves and their families, and few survived the capture. From that time, X. belonged to the Roman Empire, and suffered in the earthquake in the reign of Tiberius; but Lycia did not lose all its freedom till the time of Claudius, who reduced it to a province. X. was situated 70 stadia, or 9 miles from the sea, on the left bank of the Sibra or Sibrus, the Greek Xanthus, or Yellow River, on a plateau of elevated ground, of nearly rectangular shape, the elevated parts close to the river rising 900 feet. The most remarkable edifices in the city and its vicinity, according to ancient authors, were the Sarpedonion, or Temple of Sarpedon; that of the Lycian Apollo; and Letoon, or Temple of Leto. On the elevated ground, or Acropolis, stood the so-called Harpy Tomb, and an ancient theatre of Greek workmanship; while in the other part of the city which lay to the east was a mixture of Greek and Roman buildings. The whole city and its environs contained numerous temples and tombs. The discoveries of Sir C. Fellows in 1833 revealed the city of X., its temples and its monuments, and they appear to fall into the following classes: 1. The sepulchres of the early inhabitants, placed inside the wall in shape of square columns, with step-shaped bases, and sepulchral chamber on the summit. The most remarkable of these is the Harpy Tomb, so called from the subject of the bas-reliefs being the Harpies bearing off the daughters of Pandarus, king of Lycia—executed in a style resembling the earliest efforts of oriental Greek art. Another, with a frieze of lions and hunters in Persian style, and the inscribed obelisk, with long Lycian inscription and some Greek verses, apparently of the time of Artaxerxes Longimanus, and made about 466 B.C. 2. The tombs of the age of the Persian subjection, with roof-shaped tops and ridges, and imitation of wood-work, the sepulchral chamber for the principal dead being at the summit, the others in the middle and base, the sides ornamented with reliefs of a later style of art. Of a later style, but of more beautiful art, was the Ionic peristyle temple or monument of 14 columns, with a solid cella, placed on a base or pedestal, both temple and base ornamented with friezes, supposed to represent the conquest of Lycia by Harpagus, and with figures between the columns. The friezes represent hunts and feasts, the combats of Lycians and Persians, and the taking of the city of X. by the latter—the whole treated in a style not unlike the school of Phidias and his successors. These sculptures have been supposed to represent the exploits of Harpagus, or the suppression of the revolt of the Cilicians by a Lycian satrap, and to have been made between 460 and 387 B.C. This temple was discovered by Sir C. Fellows in 1840–1844.

The language found on the monuments of Lycia, written in an alphabet of 36 letters, is an Aryan dialect, distinguished by a prevalence of vowels. The letters, with two exceptions, are archaic Greek, and borrowed from by no means the oldest form of that language. The syntax and inflections are Aryan or Indo-European, but many of the roots are different from the languages of that family, although certain words may be referred to well-known equivalents—as *goda*, "lord," to the Persian; *tedeeme*, "son," to the Slavonic; and *ladé*, "wife," to the Anglo-Saxon. Some words, too, resemble the Zend. The presence of many Greek words barbarously transcribed can also be well recognised in the different inscriptions, and some few derived from their Persian conquerors—as *gusatrape*, or "satrap." The inscriptions are generally short and sepulchral, and follow the well-known formula commonly used under the Roman Empire, and are sometimes accompanied by Greek versions or translations, helping to explain the Lycian. One inscription alone, recording the exploits of one of the family of the Harpagi after the battle of Eurymedon (466 B.C.), on the so-called obelisk of X., is of any length. The language seems to have lasted from about the 5th c. B.C. to the 1st c. A.D.—Rawlinson, "Herodotus," vol. i. pp. 311, 673; "Synopsis of the Contents of the British Museum," 1855, p. 106; Fellows, "Asia Minor" (Lond. 1839); "Discoveries in Lycia" (1841); Birch in the "Archæologia," vol. xxx. pp. 176–204.

XAVIER, St Francis, a celebrated missionary of the Roman Catholic Church, was born of a noble family at Xavier, in Navarre, April 7, 1506. Having received his early education at home, he was sent, when in his 18th year, to the college of Sainte Barbe, at Paris, where he formed the acquaintance of Ignatius de Loyola (q. v.), with whom he ultimately became associated in the foundation of the Jesuit Society. Under that head will be found detailed so much of his history as regards

the first establishment of the order, and the early labors of its founders in Rome. It was while he was engaged in these early labors of the society in Rome, that X. attracted the notice of the representative of John III. of Portugal at Rome, Gouvea, who suggested to the king the idea of sending out members of the new order as missionaries to the Portuguese colonies in the East. X. was chosen for this purpose in the place of Bobadilla, who had been originally appointed, but was prevented by sickness from going on the expedition. Having sailed from Lisbon, April 7, 1541, and wintered at Mozambique, he arrived at Goa, May 6, 1542, and presented to the bishop his letters of authorisation from the Pope Paul III. X.'s first proceeding, on finding the excessively depraved condition of the European Christians settled in India, was to endeavor, by stirring up among them a spirit of penance and religious fervor, to remove the great obstacle to the efficacy of his preaching to the native population, which was presented by the evil example of the professing Christians of the colony. His efforts in this preliminary reformation were eminently successful, and he was equally blessed in his labors among the pearl-fishing population of the coast, from Cape Comorin to the island of Mannar. After a stay of more than a year in this region, he returned to Goa, and with a fresh staff of assistants, visited the kingdom of Travancore, where, in the space of a single month, he baptised 10,000 natives. Passing thence to Malacca, where he was reinforced by three other Jesuit missionaries, sent by Ignatius de Loyola in compliance with X.'s earnest solicitations, and having achieved great success among the residents of the coast, he proceeded, in 1546, to the Banda Islands, to Amboyna, and the Moluccas. In all these places his success was extraordinary. Having thus effected a first establishment of the Gospel in many places, he resolved to retrace his steps, and revisit the several scenes of his preaching. He arrived at Malacca in 1547, and thence by Manassar, near Cape Comorin, where he stayed for some time, he passed to the island of Ceylon, where he converted the king of Kandy, with many of his people. In May 1548, he returned a second time to Goa. His great object now was to carry out a project for the conversion of the Japanese Empire, which had been suggested to him by a Japanese of high rank, whom he had attached to himself at Malacca, and who accompanied him to Goa. This Japanese, whom, with two of his domestics, he converted and baptised, became a most valuable auxiliary. Through his aid, X. was enabled during the voyage to acquire so much of the Japanese language as enabled him to translate into Japanese and explain the Apostles' Creed; and although his success in the first island which he visited was very insignificant, yet at Firando, and afterwards at Miako, his preaching was attended with extraordinary fruits. At the latter place, he had failed signally upon his first visit, which was made in a very poor and humble guise; but having returned with a more imposing train, and under circumstances of greater outward distinction, he obtained a ready and favorable hearing, and made so lasting an impression that the mission which he founded continued to flourish for above ten years, until the final expulsion of Christianity from the Japanese Empire. His mission to Japan occupied about two and a half years; and in November 1551, he sailed from Amanguchi for the purpose of returning to Goa to organize a mission to China. Touching at Malacca, upon his voyage, he endeavored to concert with the governor an embassy in the name of the king of Portugal, to China, under cover of which he hoped to effect an entrance for his missionary enterprise, but on his return from Goa to Malacca, he found a new governor, who was opposed to any such attempt; and he was obliged to adopt the expedient of sailing in a merchant-ship to the island of Saclan, near Macao, which was at that time the trading dépôt of the Chinese with the merchants of Portugal. From Saclan, X., having procured a Chinese interpreter, hoped to induce one of the native merchants to land him secretly on the coast; but in this hope also he was baffled by the fears of the Portuguese, who dreaded for themselves the vengeance of the Chinese authorities upon this infraction of the law. This disappointment, coupled with the privations and labors to which he had been exposed, brought on a violent fever, and under the combined weight of mental depression and physical sickness, this Christian hero sunk upon the very threshold of what he had looked to as the great enterprise of his life, in the island of Saclan on the 23d December 1552. His remains were conveyed to Malacca, and thence with great solemnity to Goa, March 15, 1554. Many miracles, attested by numerous witnesses, were reported of X. in almost all the stages of his career,

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Among these, there have been some who reckoned the miraculous gift of tongues. The evidence of these miracles was submitted to the usual process of inquiry at Rome, and many miracles having been established by the ordinary canonical process, X. was "beatified" by Paul V. in 1619, and "canonised" by Gregory XV. in 1622, his festival being fixed upon the 8d December. His only literary remains are, a collection of Letters, in 5 books, 8vo (Paris 1681), and a Catechism, with some short ascetic treatises. His Life, by Père Bouhours, was translated into English by Dryden. There is also a Latin Life by Tursellino (Rome, 1594); and several in Italian, by Bartoli, Maffei, and others. The most recent English contribution to this interesting subject is that of Mr Veun.

XEBEC, an armed vessel of great speed, formerly used by the Algerine corsairs. It carried three masts on which square or lateen sails could be set. The bow and stern were remarkable for the small angle they made with the water. The sides were low, and the upper deck of great convexity, that the water might readily flow off through the scuppers. As this rendered them inconvenient for walking on, gratings were laid at the sides of the deck, to avoid the convexity. The crew walked dry on these gratings, while the water flowed out underneath. Xebecs carried from 16 to 24 guns. A few of these vessels—unarmed—still sail the Mediterranean as carriers of perishable goods.

XENIA, a handsome and flourishing town in Ohio, U. S., and important railway junction, on the Little Miami River, 65 miles north-east of Cincinnati, the centre of a rich and populous agricultural district; it has a large court-house, jail, 3 newspapers, several churches, a college, and a theological seminary. Pop. (1880) 7026.

XENOCRATES, an ancient philosopher, was born at Chalcedon 396 B. C., and died 314. At an early age, he attached himself to Plato, and in course of time, was so much esteemed for his proficiency in philosophy and high moral character, that he was thought worthy of succeeding Spensippus, Plato's successor, in the presidency of the Academy. This post he filled most creditably for 25 years. He wrote numerous treatises upon dialectics, physics, and ethics, and drew with unusual precision the boundaries between these three departments of philosophy. Of these works, merely the titles have been preserved; and what is known of his doctrines is gathered only from notices of them contained in various authors. He introduced into the Academy, to a greater degree than before, the mystic Pythagorean doctrine of numbers, in connection with the *ideas* of Plato. Zeus, the father, ruling in heaven, he called Unity, as being uneven number and spirit; the World-soul, which operates through all things liable to motion and change, he styled Duality. This divine world-soul dwells in the heavenly bodies, the Olympic gods, the elements of nature, and also in terrestrial demons, whom he regarded as intermediates between gods and men. In his ethical teaching, he aimed at making the Platonic doctrines more directly applicable to ordinary life in individual cases, and pitched his standard of excellence very high. He held that virtue is in itself valuable, while other things are only so conditionally, and that it extended to thoughts as well as actions. He was himself of irreproachable character, of a well-balanced mind, and temperate in his habits without cynicism. His conversion of the youthful debauchee Polemo into an earnest, virtuous man, and his disregard for wealth, as shown by his refusal of the offers of Philip and Alexander, are the best known incidents in his long, useful, and virtuous career.

XENOPHANES, founder of the Eleatic School of Philosophy, was born at Colophon, in Asia Minor, about 580 B. C., or, according to others, about 40 years earlier. He spent the greater part of a life, which was prolonged beyond his 90th year, in banishment. He passed many years in Sicily, and resided for some time at Elea (whence adj. *Eleatic*), in Lucania. He composed many poems, historical, didactic, and elegiac, which have all perished, except a few fragments. He employed his poetry as the instrument for disseminating his philosophical tenets. He was the first to maintain the Eleatic doctrine of the oneness of the universe; and recognising clearly the unity and perfection of the deity, he attacked the prevalent mythology and the practice of attributing to the godhead a human form and human weaknesses. He was thoroughly in earnest, but his logic was confused and contradictory. While he held the existent to be identical with the deity, and regarded it as the basis of phenomena,

he also maintained that the divine essence was neither finite nor infinite, neither moved nor unmoved; not finite, for then it must be limited by another, whereas God is one; nor, on the other hand, infinite, for only non-being is infinite, as having neither beginning, middle, nor end. The distinguishing tenet of X. is his Monotheism; and as a philosophical rhapsodist, he sought to inculcate it, though he failed to express it in a clear and systematic manner. His speculations are sceptical in their tendency, and appear to have had great influence upon succeeding philosophers. His explanations of physical phenomena were crude; but one is recorded in which he has anticipated modern geology. From the shells and marine petrifications found on mountains and in quarries, he inferred that the surface of the earth had risen gradually out of the sea. In the 18th c., Voltaire could give no better explanation of the fact of sea-shells being found on the mountains of Spain, than the supposition that they were the scallop-shells dropped by pilgrims journeying to and from the shrine of St. James.

XENOPHON, celebrated as a general, historian, and philosopher, was born at Athens 445 a. c. At an early age, he became a pupil of Socrates, and is said to have been saved from death by that philosopher at the battle of Delium. At the age of 40 or thereabouts, he joined the expedition of the younger Cyrus against his elder brother, Artaxerxes Mnemon, king of Persia. After the battle of Cunaxa and the treacherous massacre of the Greek generals, X. played an important part in the adventurous retreat known in history as the Retreat of the Ten Thousand; and it was his courage and conduct that contributed mainly to its success. After having returned to Asia Minor, X. led a portion of his forces upon a pillaging expedition, and amassed wealth enough to enable him to live the life of a country gentleman. Before retiring, he served under Agesilaus, the Spartan general, against the Persians; and at Coronea fought against his own countrymen. Sentence of banishment had been previously passed upon him at Athens, probably for his share in the Cerean expedition. His sympathies were entirely Spartan. He soon afterwards settled at Scillus, a small town near Olympia, in Elis, under Spartan protection, where he lived upwards of 90 years, occupying himself with hunting, agriculture, and writing. He is not mentioned as having ever returned to Athens, though his sentence of banishment was repealed, and his two sons were in the Athenian division which aided the Spartans at Mantinea. At last, X. was driven from his retreat at Scillus by the Eleans, and took refuge in Coriuth, where he probably died, 355 a. c. His works are numerous, and to judge by their titles and number, all extant. His style is simple, elegant, but rather monotonous and deficient in vigor. As a philosopher, he holds no very high rank. He possessed excellent practical talents, was a humane, sensible, religious man, but seems to have had neither genius nor taste for speculative philosophy. His principal works are the "Anabasis," or narrative of Cyrus's expedition, and the Retreat of the Ten Thousand; a "History of Greece" in continuation of Thucydides; the "Cyropaedia," or education of Cyrus the Elder—a sort of political romance, in which Cyrus is drawn as the model of a wise and good ruler. In the latter work, X. clearly shows his preference of a well-regulated monarchy to the democracy of his native country. He wrote besides the Reminiscences ("Memorabilia") of Socrates, a series of dialogues intended to refute the charges upon which that philosopher was executed; also treatises on Hunting, on the Horse, the Revenues of Athens, and Domestic Economy.

XERES-DE-LA-FRONTERA, or Jerez-de-la-Frontera, an important town of Spain, in the province of Cadiz, and 14 miles directly north-east-by-north from Cadiz, near the right bank of the Gadelete, and on the railway between Cadiz and Seville. The houses are generally well built, and the streets and squares clean, spacious, well paved, and well lighted. The wealthy wine-merchants mostly reside in the suburbs. X. is an ancient town supposed by many to be the *Asa Regia Caesariana* of the Romans. X. has manufactures of woollen cloth and leather, and a considerable trade in corn; but all these are of little consequence in comparison with its wine-trade. *Sherry* derives its name from Xeres-de-la-Frontera. Some of its *bodegas*, or wine-stores, are of vast dimensions. They are not wine-vaults, but stores erected above ground. The greater part of the wine of X. is exported to England; and some of the principal wine-merchants are of French and Scottish extraction. Pop. about 50,000.

Xeres
Ximenes

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XERES-DE-LOS-CABALLE'ROS, or *Jerez-de-los-Caballeros* (anc. *Emrita*), a town of Spain, in the province of Badajoz, and 40 miles south from Badajoz. X. is a picturesque old town, partly surrounded by a Moorish wall. The ecclesiastical edifices are remarkably numerous. There are manufactures of woollen and linen cloth. Amongst the chief articles of trade, besides the produce of the manufactures, are pigs and fruit. Pop. about 6000.

XERXES I. (the name is perhaps akin to Sanscrit *kshatra*, king), king of Persia, was the eldest son of Darius and his second wife Atossa, and was appointed successor by his father, in preference to Ariabazanes, his eldest son by his first wife whose children were all born before Darius became king. Darius died in the beginning of the year 485 B. C., in the midst of his preparations for a third expedition against Greece. X., after having subdued the rebellious Egyptians, and appointed his brother Achæmenes governor, gave his whole attention to the completion of the preparations begun by his father, which occupied nearly four years. Immense hordes of men were gathered together from all parts of the vast Persian Empire, from the steppes of Central Asia, from the banks of the Indus and its tributaries, and from the interior of Africa; an enormous fleet was furnished by the Phœnicians and other maritime nations subject to Persia; stores of provisions sufficient to support the immense army were collected at different points along the intended route of march. A bridge of boats, an English mile in length, under the superintendence of Egyptians and Phœnicians, was built across the Hellespont. The bridge, however, was destroyed by a storm, on which (according to the Greek historians) X. ordered the heads of the engineers to be cut off, and was so enraged at the rebellious and disrespectful sea, that he ordered 300 lashes to be administered to it, and a set of fetters to be cast into it. Another bridge, consisting of a double line of boats, was built; and a canal was cut through Mount Athos, at the point of the peninsula of Acte in Macedonia, on which the fleet of Mardonius had been wrecked in 492 B. C. The preparations were completed in 481 B. C., and in the autumn of that year, X. arrived at Sardis, where he wintered. In the spring of the following year, the vast assemblage began to march towards the Hellespont; and, according to Herodotus, it took seven days and nights to march across the bridge. After crossing the Hellespont, the march was continued along the Thracian coast towards Doriscus on the Helbrus, where a halt was made on a large plain, and the army numbered. The fleet drew up near to Doriscus. According to Herodotus, the whole number of fighting-men, military and naval, amounted to nearly 2,500,000, and the fleet consisted of 1207 ships of war, besides 3000 smaller vessels. These numbers were considerably increased during the march between Doriscus and Thermopylæ by the Thracians, Macedonians, Magnesiens, and other nations through whose territories X. passed on his way to Greece. Herodotus supposes that the number of camp-followers, exclusive of eunuchs and women, would amount to more than that of the fighting-men; so that, according to him, the whole number of people assembled on this occasion would be considerably over 6,000,000, a number greater than the entire population of Ireland. This number is doubtless greatly exaggerated; still it cannot be doubted that this was one of the greatest multitudes ever brought together for any purpose under the sun. Grote, who discredits the immense numbers given by Herodotus, nevertheless says: "We may well believe that the numbers of Xerxes were greater than were ever assembled in ancient times, or perhaps at any known epoch of history." This immense force moved on without resistance through submissive nations till it reached Thermopylæ (q. v.), where it was brought to a stand by the army of Leonidas (q. v.). Although the Greeks were entirely defeated and slain, it was not without heavy loss to the Persians. On the same day, and on the third day after, the Persian fleet, which had previously suffered severely from a storm, was defeated with heavy loss by the Greeks off Cape Artemisium in Eubœa. X. continued his march on to Athens through Phocis, which he laid waste, and Boeotia, whose inhabitants joined him, with the exception of those of Plataea and Thebes, which cities he burned. A detachment which he sent to attack Delphi met with a signal defeat. When X. arrived at Athens (in the summer of 480, three months after crossing the Hellespont), he found the city deserted, the Athenians having sent their families to Troezen, Egina, and Salamis. Athens was destroyed. Meantime the two fleets had sailed round from Eubœa and taken up their positions in the narrow strait between Salamis and the Attic coast, where the famous naval battle of

Salamia took place (September 490 B.C.). See SALAMIS. X. witnessed the fight from a lofty throne which he had caused to be erected on one of the slopes of Mount Aegaleus,

"The rocky brow
Which looks o'er sea-born Salamis."

X. was apparently confounded at the unexpected and inglorious result of all his mighty preparations for the overwhelming of Greece, and becoming alarmed for his personal safety, fled, under an escort of 60,000 men, with all haste towards the Hellespont, which he reached in 45 days. The bridge of boats having been again destroyed by a storm, he crossed over to the Asiatic coast in a vessel. Mardonius was left with 800,000 men to carry on operations in Greece. In 479 B.C., the Greeks defeated Mardonius in the famous battle of Platea (q. v.), and on the same day gained another victory over the Persians at Mycale in Ionia. Next year (478 B.C.) the Persians lost their last possession in Europe by the capture of Scythia on the Hellespont. The war was continued for a few years longer, though the struggle was now virtually at an end. Little more is known of the personal history of X., except that, in 465 B.C., he was murdered by Artabanus, who aspired to the throne, and was succeeded by his son Artaxerxes. From all that is known of X., he appears to have been utterly ignoble in character, vain-glorious, licentious, cruel, cowardly—the very *beau-ideal*, in short, of the worst kind of eastern potentate. His history would be scarcely worth recording were it not for his connection with Greek history. His famous invasion was undertaken apparently for no other purpose than to gratify a weak-minded vanity, which was delighted with the idea of being able to assemble at one time "ships by thousands" and "men in nations," who were at the mercy of his unprincipled caprice.

XIMENES, Francis de Cisneros, by which latter name he is commonly called in Spain, the well-known statesman, archbishop, and cardinal, was born of a humble family at Torrelaguna, in Castile, in 1437. He was educated at Alcalá de Henares, Salamanca, and finally Rome, where he obtained from the pope a provisional or prospective nomination to a prebend in the cathedral of Toledo. The archbishop, resisting the papal claim of "provisor" refused to admit X.; and on his persisting in his claim, put him in prison, where he was detained for a long period. On his release, he was named Vicar-general of Cardinal Mendoza at Signena; but he gave up this preferment, and entered the Franciscan order in 1482. His reputation for piety and learning, led the queen, Isabella, to choose him, in 1492, for her confessor; and three years afterwards, to name him Archbishop of Toledo—a dignity which he refused to accept until he received an express command from the pope. Having yielded in the end, he continued as archbishop the life of mortification and austerity which he had practised in his monastery; and he applied to purposes of religion, charity, and public utility the whole of the princely revenues of his see. As confessor and confidential adviser of the queen, X., during the lifetime of Isabella, was the guiding spirit of Spanish affairs; and on her death in 1504, he held the balance between the parties of Ferdinand and Philip of Burgundy, husband of Joanna, the heiress of the crown. On the death of Philip in 1506, X. was appointed Regent, in consequence of the incapacity of Joanna and the absence of Ferdinand, and conducted the affairs of the kingdom through a most critical time with consummate skill and success. In 1507, he was created Cardinal; and in the following year, he organized, at his own expense, and himself accompanied as commander, the celebrated expedition, consisting of 10,000 foot and 4000 horse, for the conquest of Oran, on the African coast. Ferdinand died in January 1516, and on his death-bed named X. Regent of Spain till the arrival of his grandson Charles; and although the grandees had organized an opposition as well to himself as to the royal authority, X., by his prompt and able dispositions, overawed them into submission; and subsequently, by the same exercise of vigor and determination, quelled the insipient revolt of Navarre. In order to the better consolidation of the royal authority in Spain, X. urged very strongly the speedy visit of Charles, who still lingered in his Flemish principality; but it was not till after the lapse of a year and a half, that the king decided on his journey; and meanwhile, the enemies of X. had so worked upon his jealousy and pride, that he took the ungracious and ungrateful course of dismissing his faithful, but, as he feared, too powerful servant. X. had set out to

Xylodina
Yach.

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meet the king, and although laboring under great infirmities, continued to prosecute his journey, when he was seized with a mortal illness at Brauguillas, near Arauda de Duero, where he died, November 6, 1517.

As a statesman and administrator, the reputation of Cardinal X. is deservedly of the very highest. The social and political revolution which he effected in breaking down the feudal power of the nobles, has often been compared with the analogous change wrought in France by Richelieu. But the revolution of X. was, at least in its results, rather in the interest of the people than, like that of Cardinal Richelieu, of the crown; and while it freed the sovereign from the unworthy position of dependence on the nobility, it established the municipalities and the communal representatives in the enjoyment of certain well-defined and undoubtedly substantial privileges and immunities. His munificence as a patron of religion, of letters, and of art, has been the theme of praise in every history of his time. The university of Alcalá de Henares, which he planned, organized, erected, and endowed, was a marvel of enlightened munificence in such an age, and may compare advantageously with even the most princely foundations of the most enlightened times. His "Complutensian Polyglot" (q. v.), besides being the first of its class, was, considering the resources of the period, perhaps the grandest in conception among the projects of its own order; and the perseverance with which, during the long period of fifteen years devoted to its preparation, he watched and directed its progress, is an evidence that it originated from a genuine love of sacred learning, rather than a passing impulse of literary enthusiasm. The cost of this gigantic undertaking amounted, on the whole, to 80,000 ducats. His expenditure on churches, hospitals, schools, convents, and other works of religion and benevolence, was on a scale of corresponding munificence. He maintained thirty poor persons daily at his own cost, and he regularly set apart one half of his income to the uses of charity.—See Hefele's "Der Cardinal Ximenes und die kirchlichen Zustände Spaniens am Ende des 15. und Anfange des 16. Jahrhunderts" (Tübingen, 1861).

XYLO'DIN is a substance which is precipitated in the form of a white powder, insoluble in water, alcohol, and ether, when water is freely added to a solution of starch in cold nitric acid. Its composition is not determined with positive certainty, but it is probably starch, $C_{12}H_{10}O_6$, in which either one or two atoms of hydrogen are replaced by a corresponding number of atoms of peroxide of nitrogen, NO_2 . According to Professor Miller, there is a substitution of two atoms, so that the formula representing X. is $C_{12}H_8(NO_2)_2O_6$. It explodes when sharply struck, and burns with violence at 356°. By the action of reducing agents, it is again converted into starch.

XY'LOL (Gr. *xylon*, wood) is an oily aromatic fluid with a strong refractive power, and boiling at about 263°. Its composition is represented by the formula $C_{10}H_{10}$, and it is regarded as the hydride of a non-isolated radical, $C_{10}H_9$, to which the name *Xylol* is given. Xylol, mixed with toluol, cymol, and cymol, is found amongst the oils which are separated from crude wood-spirit by the addition of water.

XYLO'PHAGA (Gr. wood-eaters), a family of *Coleoptera*, of the section *Tetramera*, nearly resembling weevils, but differing from them in the want of a beak. They have short antennae, thickened towards the tips, and sometimes leafy from the base. The species are numerous, and are arranged in many genera. They mostly live in wood, on which they feed, both in their perfect and larval states. Some of them are very destructive to trees and timber. See *BARK BEETLE* and *SCOLYTUS*. Some of the X. live in fungi, and feed on them.

Y

Y, the last letter but one of the English alphabet, is derived from the Greek *Υ* (*υ*). It had no place in the earlier Latin alphabet, and only came into use by Roman writers in the time of Cicero in spelling words borrowed from the Greek. In the Greek of the classic age, *υ* (*Υ*) no longer retained its pristine power (Ital. *u* or Eng. *oo*), but had degenerated into a sound like the French *u*, or even nearer to *i* (*ee*); it could not therefore be represented by the Roman *u* or *v*, which had remained (and remains yet in modern Italian) undegenerated, and thus was appended to the Roman alphabet as a new character. Its use in native Latin words, as *sylla* for *silva*, *satyra* for *satira*, is an error of modern editors. Italian has no *y*, but uses *i* instead, as *sinfonia*, symphony. The other modern languages of Europe have not only retained it in spelling words of Greek origin, but some of them substitute it for *i* in native words, generally in a very capricious manner. German orthography has recently been purged of this abuse; and in Dutch, where it had always the sound of English *i* (*af*), the double character *ij* is now written. In English, it is used to represent the semi-consonantal power of *i* or *j* (see *I* and *J*) in the beginning of a word and before another vowel, as *yoke* = Lat. *yugum* or *fugum* = Ang.-Sax. *two*; *young* = Ang.-Sax. *iong* = Ger. *jung*. It has been suggested that the practice of writing *y* at the end of a word instead of *i*, while we replace it by *i* on adding a syllable (e. g., *lovely*, *lovelier*), may have arisen like the habit of giving a tail to the last unit of the Roman numerals (e. g., *ij*, *lii*), in the wish to give a kind of finish to the word and please the eye. The would-be antique spelling *ye*, *ye*, for *the*, *that*, is a blunder, arising from mistaking the Ang.-Sax. *þ* (= *th*) for a *y*.

YABLONOI' MOUNTAINS, a name that has long had a place in the geography of the north-east of Asia, designating a range of mountains which are found to have no existence, the locality in which they were supposed to be placed being an undulating plateau.

YACHT is a small vessel constructed so as best to insure strength, elegance, and speed, and exclusively employed for pleasure-sailing. Vessels of this sort were first constructed in this country in 1604, at which date a yacht was built by the king's master-shipwright for Henry, eldest son of James I. of England; the idea of such a vessel being taken from the Dutch, among whom they had been employed for some time previous. From this time, yachting, steadily patronised by royalty, became a favorite pastime of the nobility and gentry, and there are now about 60 yacht clubs in the United Kingdom, possessing, according to the "Yacht List" of 1876, 8164 yachts. This amusement is encouraged by government, mainly because it supplies an excellent training for seamen, who in time of war become available for the royal navy, while in time of peace they are no burden on the national treasury; and accordingly, yachts are allowed to bear the ensign of the royal navy, supplemented by the special flag granted by the Admiralty to each club, and to rent and revictual in the royal dockyards. The oldest yacht club in the United Kingdom is the *Royal Cork*, which, under the title of the "Water Club of Cork" is known to have existed as early as 1720; and the next in order of seniority is the *Royal Yacht Squadron*, founded in June 1815, and having its headquarters at Cowes, Isle of Wight. The club which stands first as to the number of its members and yachts is the *Royal Thames Yacht Club*, which was founded in 1823, and has its headquarters in London. Of the other clubs, 6 are Scotch (4 on the Clyde and 2 on the Forth), 8 Irish (2 at Queenstown, 2 at Kingstown, 1 at Dublin, 1 at Belfast, 1 at Carlingford Loch, and

1 at Loch Erne), and the rest English, being mostly located on the Thames, the channels between Southampton and the Isle of Wight, or the n. coast of Wales, from Liverpool to Holyhead. More than half of these clubs have been founded since 1840. Yachting is gaining ground in foreign countries and in the British possessions, the United States ranking next to Great Britain and Ireland in the number and importance of her yacht clubs (the chief of which is the New York Yacht Club); and Holland, Belgium, France, Australia, Bermuda, Canada, and Russia have similar associations.

The principles adopted in the construction of yachts have fluctuated greatly, from the simple unpretending rig, small tonnage, and clumsy build of the early yachts of the Royal Cork Club, to the immense canvas area, larger size, and long narrow build of the yacht of the present time. The yacht of the early part of the century was built with a fine run aft, and a bluff bow; but about 20 years ago, this style was supplanted by increased sharpness of bows and stern, a raking (slanting upwards and backwards) stern-post, more depth, the draught aft double of that forward, great fineness of the water-lines, narrow beam, and immense sail. The effect of these changes was a great increase of speed, attended, however, with certain defects: one of which was that the diminished breadth of beam injuriously affected buoyancy, and the yachts consequently were more liable to be wetted in a heavy sea. In 1861, the hollow manner in which the crack yachts of the principal clubs in England were beaten by the yacht *America* of the New York Yachting Club, shewed their owners and builders that they had still much to learn in the way of improvement; and, with few exceptions, they wisely took the lesson. The *America* had great breadth of beam, comparatively little depth inside, an upright stern-post, extremely sharp entrance, and fine water-lines, and (the most remarkable feature) her maximum breadth considerably abaft the centre. With the exception of the great breadth of beam, and little depth inside, all the other characteristic points of the American yacht were adopted by the builders of yachts in this country; the difference between the draught aft and forward was diminished; and the result of these changes has shewn that they were great improvements.

The materials used in the building of yachts are wood, iron, and steel; wood alone, wood and iron together, iron alone, and steel alone, being the various ways in which the materials are employed. Yachts built of wood, or of wood and iron, are generally coppered to protect the planking, and secure the smoothness of surface essential to speed. The considerations which determine the relative length, breadth, depth, &c., are treated of under SHIP-BUILDING. Considerable stimulus is given to improvements in construction by the numerous prizes which are offered for competition by the various yacht clubs, and which amounted in 1875 to £14,000, besides cups. These small, but powerfully built and thoroughly sea-worthy vessels have traversed every sea on the globe; numbers make trips to Norway and the Mediterranean; a few visit America and the Indian and Southern Oceans; and one or two have circumnavigated the globe. Some of the most remarkable performances of yachts are the voyage from New York to Liverpool of the *Charter Oak*, 33 tons, in 36 days; that of the *Sylvie*, 205 tons, from Halifax to Havre, in 16½ days; those of the *Inca*, *Katinka*, and *Vivid*, 25 tons each, from England to Australia; and the great Atlantic yacht-race from New York to Cowes, in December, 1866, which was won by the *Henrietta*, 205 tons, after a voyage of 14 days. Yachts may be divided, according to the style of their rig, into Cutters (q. v.), fore-and-aft and square topsail Schooners (q. v.), and Yawls (q. v.). The tonnage of these vessels is very variable, ranging from 3 to 420 tons in Britain, the average tonnage being 30–50 tons. Steam-yachts (screws) are now exceedingly common, their independence of wind making them very popular. The *Victoria* and *Albert* and the *Fairy*, both belonging to her Majesty, are specimens of this class.

YĀJNAVALKYA is the reputed author of the *S'atapatha-Brahman's* (see *Yajurveda*, and under *VEDA*), and of a *Dharmasāstra*, or law-book (see *SANSKRIT LITERATURE*, sec. *Law*). His name points to his being a descendant of Yajñavalka; and according to tradition, he was also a descendant of *Vishvāmitra* (q. v.), and belonged to a branch of the *Kurūitas*. He seems to have occupied an influential position at the court of King Janaka of Videha. Nothing certain, however, is as yet known regarding the age at which he lived.

YAK (*Bos grunniens*), a species of ox found in Tibet, and domesticated there. It is ranked by Colonel Hamilton Smith in the genus *Bison*, along with the Bison, Gaur, and Gayal, and by Mr Gray in the new genus *Poephagus*. The wild yak of Central Asia is the largest native animal of Tibet, and is found only near the limits of perpetual snow, descending into the higher wooded valleys in winter, and ascending in summer to the pastures of short grass and *carices*, some of which are at an elevation of 17,000 feet above the sea. It is hunted by large dogs, and is very fierce, falling upon an adversary not only with its horns but with its chest, and crushing him by its weight. It is generally black. The yak has been domesticated from time immemorial, and forms great part of the wealth of the inhabitants of the highest and coldest regions of Central Asia. The domesticated yak is about the height of an English ox, which it much resembles also in figure of body, head, and legs. It is covered all over, however, with a thick coat of long silky hair, hanging down like the fleece of a sheep. The head is rather short; the eyes large and beautiful; the horns not very large, spreading, tapering from the base, a little turned back at the tips, a space between them on the forehead covered with a mass of curling hair; the nose is smooth and convex, the nostrils small. The neck is short; the withers high and arched; the rump is low; the legs are short. Over the shoulders there appears a bunch somewhat like that of the zebu, but it consists only of long hair. The hair of the whole ridge of the back is long and erect, but not harsh. The tail is covered with a prodigious quantity of long flowing hair, descending to the hock, and has much the appearance of a large bunch of hair artificially attached. Not a joint of it is visible. From the chest, between the fore-legs, issues a large pointed tuft of long hair. The hair of the shoulders, rump, and upper parts of the body is comparatively thick and short; but that of the lower parts is long and straight, hanging below the knee, and sometimes even to the ground. Yaks exhibit great variety of colors; but black and white are the most prevalent. It is not uncommon to see the long hair on the ridge of the back, the tail, the tuft on the chest, and the legs below the knee white, whilst all the rest is jet black. The great quantity of hair, evidently a protection against the cold of the climate for which it is destined, gives the yak an apparent size far beyond the reality.

The yak does not low like an ox, but utters a short grunting sound like a pig, as the expression either of uneasiness or of satisfaction.

It delights in steep and rocky places. Hooker, in his "Himalayan Journal," describes the calves as "the drollest of animals, like ass-colls in their antics, kicking up their short hind-legs, whisking their bushy tails in the air, rushing up and down the grassy slopes, and climbing like cats to the top of the rocks." The yak is capable of becoming very tame. The Tibetan girls call the yak cows by a peculiar cry to be milked.

The milk of the yak is very rich, and the curd made of it is much used by the Tibetans, both fresh and dried, often powdered into a kind of meal. The butter made from yak-milk is excellent, and is preserved for a long time in the dry and cold climate of Tibet in bladders. It is an important article of Tibetan commerce. The flesh of the yak is of the finest quality; that of the calves is much superior to ordinary veal. Yak flesh is often dried in the sun by the Tibetans, and eaten raw. The yak is never used for tillage or draught, but is very much employed as a beast of burden, and travels at a slow pace twenty miles a day, where no other beast of burden could well be employed. The lazy and luxurious lamas of Tibet often ride upon it, an attendant leading the animal. The hair is spun into ropes, and made into coverings for tents. The soft fur on the hump and shoulders is made into a fine and strong cloth. Caps, jackets, cloaks, and blankets are made of the skin with the hair on. The tails are the *chowries*, or fly-flappers, used in all parts of India, and which are to be seen particularly on all occasions of state and parade, and sometimes in the hands of the meanest of grooms, sometimes of the highest officers of state.

There is much reason to think that the yak deserves a degree of attention which it has not yet received. It is still confined to its native region, whereas it is probably adapted to increase the productiveness and wealth of many parts of the world. It seems extremely suitable to Norway, Iceland, and other northern countries, and perhaps might be advantageously introduced into the Highlands of Scotland. Its

Yaksha
Yama

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hair is probably fit for other textile purposes than those to which it has been applied by the rude Tibetans.

YAKSHIA is, in later Hindu Mythology, the name of a kind of demigods, who especially attend on Kṛṣṇa, the god of riches, and are employed in the care of his garden and treasures. According to the Viṣṇu-Purāṇa, they were produced by the god Brahma, as beings emaciated with hunger, of hideous aspect, and with long beards; but Brahmanic poetry generally represents them as inoffensive, and in the Meghadūta of Kālidāsa (q. v.), it is a Yaksha banished from his wife who utters the most poetical thoughts, and is capable of the tenderest feelings. The Buddhists, on the contrary, describe them in some of their legends as cruel demons, who feast on serpents and human corpses, and when filled with the flesh they have devoured, indulge in fierce combats; but in others, again, as beings who also delight in dances, songs, and amusements, and sometimes even enter the paths that lead to nirvāṇa. In Buddhist legends, they also possess the power of raising storms, and altogether occupy a far more prominent position than is allowed them in the Brahmanic pantheon.—See E. Burnouf, "Introduction à l'Histoire du Bouddhisme Indien" (Paris, 1844); the same author's translation of "Le Lotus de la Bonne Loi" (Paris, 1852); and Spence Hardy's "Manual of Buddhism" (Lond. 1853).—The Yakshas of the Brahmanic mythology have wives, Yakshis, who sometimes appear in the train of Umā (q. v.).

YAKUTSK. See JAKUTSK.

YALE COLLEGE, an institution of learning in New Haven, Connecticut, U.S., founded in 1700 as the collegiate school of the colony of Connecticut, under the trusteeship of the ten principal ministers of the colony, who each contributed a gift of books. It was first established at Saybrook, and in 1716 removed to New Haven. Among its early patrons were Governor Yale, whose name it bears, and Bishop Berkeley. Of its four faculties, the medical was organised in 1813, the theological in 1822, the legal in 1824, and the philosophical in 1847. Its government consists of the governor and lieutenant-governor of the state, six fellows, its president, and ten ministers. The library has about 80,000 vols. There is a geological and mineralogical cabinet of 80,000 specimens, and the college has the historical pictures and portraits of Trumbull. It has 100 instructors and about 800 students, and has had about 10,000 graduates.

YAM (*Dioscorea*), a genus of plants of the natural order *Dioscoreaceae*, distinguished by an inferior ovary and membranous winged fruit. The species are mostly tropical, natives of the East and West Indies, &c. They have tuberous roots and herbaceous twining stems. The great fleshy roots of some of them are very much used as an article of food, in the same way that potatoes are in more temperate climates. They contain much starch, and generally become somewhat mealy and pleasant to the taste when boiled. This, however, is not the case with all: the roots of *D. triphylla*, *D. demonum*, *D. virosa*, and several other species with ternate leaves are very nauseous even when boiled, and are poisonous. The tubers of all the yams contain an acid substance, which, however, is dissipated by boiling, except in the species with compound leaves. The WINGED YAM (*D. alata*) is an article of food in daily use in the South Sea Islands. The roots are 1½–8 feet long, and often 30 lbs. in weight, with a brownish or black skin, juicy and reddish within. They vary exceedingly in form. The stem, which is winged, twines up tall poles which are provided for it by the cultivator; the leaves are between heart-shaped and arrow-shaped. Two or three small tubers are generally found in the axils of the leaves. It is supposed that this species may be the original of most, or perhaps all, of the yams cultivated in the tropical parts of Asia, Africa, and America—as the Common Yam of the West Indies (*D. sativa*), which has a round stem and heart-shaped leaves; *D. bulbifera*, in which the tubers in the axils of the leaves attain the size of apples; the Prickly Yam (*D. aculeata*), which has a prickly stem, and a fasciculated, tuberous root; *D. globosa*, the most esteemed yam of India, which has very fragrant flowers, and roots white internally; *D. rubella*, another Indian kind, with tubers sometimes 3 feet long, tinged with red below the skin; &c. The species are not well ascertained. Yams are propagated by means of their tubers; the small axillary tubers, or the small tubers produced at the base of the stem around the neck of the large tuber,

being used for this purpose.—A species of yam (*D. Batatas*) has recently been brought from the temperate parts of China, where it appears to have been long in cultivation, and is found to succeed well in France. It is hardly enough to endure the climate even of Scotland without injury; but the heat of the summer is not sufficiently great and long continued for its profitable growth, so that, in general, the plant merely lives, without producing a large tuber. The root is of very fine quality, and attains a very considerable size. The stem requires the support of a pole, round which it twines; the leaves are more elongated and acuminate than those of the West Indian yams; the root strikes perpendicularly down into the ground, and forms its tuber often at a very considerable depth, which is sometimes inconvenient to the cultivator; but this is prevented by putting a slate under it.

YAMA, the Hindu god, who, at the epic and Purāṇic period of Hinduism (see INDIA, sec. *Religion*), is the sovereign of the Manes, and the judge of the dead, is, in the hymns of the "R'igveda," a son of Vivas'wat and Saran'yā, and a twin-brother of Yamī, whose desire to become his wife he resists. His father is sometimes also called the *Gandharva*; and he is further represented there as possessing two four-eyed dogs, which guard the road to his abode (see J. Muir, "Yama and the Doctrine of a Future Life, according to the R'ig-, Yajur-, and Atharva-veda" in the "Journal of the Royal Asiatic Society," New Series, 1865, vol. i. p. 287, ff.). The idea represented by these mysterious deities has been differently understood. Professor Roth takes Vivas'wat for the light of heaven, Saran'yā for the dark storming cloud, and Y. and Yamī as representing the first human pair—the originators of the race, or the Vedic Adam and Eve produced by the union of the damp vapor of the cloud and the heavenly light. The Vedic hymns, however, do not afford the slightest ground for such a fantastical interpretation of these names; and as regards that of Y. and Yamī, they discontinue it even distinctly by describing Y. as resisting the sexual alliance with his sister. Professor Max Müller understands Vivas'wat to represent the sky; Saran'yā, the dawn; Y., the day; and Yamī, the night ("Lectures on the Science of Language," 2d Series, Lond. 1864, p. 509, ff.). But this interpretation, too, is open to the strongest doubts, inasmuch as there is no valid ground for identifying the luminous deity Vivas'wat with the sky, or Saran'yā (from *saran'a*, going, moving) with the dawn. It seems more probable that the phenomena symbolised by this myth are not of a luminous, but of an aerial character; the kindred myth of a luminous character being that of the *As'vins*, who are likewise the twin progeny of Vivas'wat and Saran'yā, or rather of Vivas'wat and "a form similar to that of Saran'yā," and who represent the transition from darkness to light, and the inseparable duality produced by the intermingling of both (see J. Muir, "Contributions to a Knowledge of the Vedic Theogony and Mythology, No. 2," in the "Journal of the Royal Asiatic Society," vol. ii. 1865). For as Vivas'wat, "the expanding," probably implies the firmament "expanding" to the sight through the approaching light, *Gandharva*, as usual, the solar fire, and Saran'yā, the dark and cool "air" (the moving element), Y. and Yamī seem to represent the current of air produced by the effect of the solar heat emanating from the firmament on the cool air of the night, when the antagonism between the warm and cold air of which this current consists would be Y. repelling the unfou with his sister Yamī, though, at the same time, they are "husband and wife while yet in the womb" (of the night-air). And since this phenomenon extends over the whole atmosphere, the two four-eyed watch-dogs of Y. are probably the eight or twice-four regions of the compass, either each couple of them taken together with their intermediate regions—whence both dogs are called spotted—or the four regions and the intermediate four taken separately—whence one dog is also called dark, and the other spotted. Y. being produced by the solar heat, it becomes then intelligible why it is said of Agni, the (solar) fire, that he is born as Y., and Y. being a phenomenon of the air, why he is also identified with Vāyu, the wind, and why the intermediate space between heaven and earth is assigned to him as his domicile. It is probably a later conception of the Vedic period which describes this abode as having been made for him by the spirits or *Manes*, and Y. as having been the first who found his way to it; and a still later one, which represents him as the first of mortals who went to that world, for in passages where these ideas are expressed, there is an association between the moving air and departed life which is foreign to the oldest notions of the Vedas. It led to the position which subsequently

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Y. assumed as a luminous king who dwells together with the Manes, and as the lord of Death—death then becoming his messenger. Yet in the "R'igveda," he has not yet the office of judge of the dead which is assigned to him in the later mythology of the epic poems and Purāṇas, and probably already in some of the Upanishads. At the epic and Purāṇic period, Y. entirely loses his comical character, though he is still called the son of Vivasvat. He then marries 18 daughters of the patriarch Dakṣha, is installed as the king of the Manes, becomes the regent of the South, and resides in Yamapura, a town of the infernal regions, where he sits in judgment over the souls of the departed which are brought before him. They are generally fetched by his messengers, who draw them with nooses out of the bodies which they animated; but in the case of very pious persons, he assumes himself the function of separating the soul from the body. After the soul has been brought before him, he orders his recorder, *Chitraguṇḍa* or *Chandraguṇḍa*, to read to him an account of all the good and bad actions it had done during its life, and which are kept registered in a book called "Agrasandhāni;" and according to their merit or demerit, it is sent to heaven or the infernal regions. The precise knowledge which the Purāṇas pretend to possess of all these proceedings, also extends to the description they give of this recorder, and to their enumeration of the assessors who co-operate with Y. at his court.—Y.'s sister is *Yamudā* (q. v.). Amongst his other names, *Dharma* ("justice"), *Dharmadja* ("king of justice"), *Antaka* ("the ender"), *Kāla* ("time"), and *S'raddhadeva* ("the god of the S'raddha," q. v.), are of usual occurrence.—When represented, he is of grim aspect; his color is green, his garments red, and he rides on a buffalo with a crown on his head, in one hand holding a club, and in another the nooses.

YAMBU, or Yembo (*Jambā* of Ptolemy), a maritime town of Arabia, on the coast of the Red Sea, about 130 miles south-west of Medina, stands on the edge of a barren plain that extends between the mountains and the sea, fronting the northern extremity of a narrow winding creek. It shares with other places the title of "Gate of the Holy City," and is the third quarter of the caravan road from Cairo to Mecca, and is thus a place of considerable importance. Y. being the port of Medina, is supported by a considerable transport-trade and extensive imports from the western coasts of the Red Sea. The harbor is good and well sheltered. It is surrounded by walls with turrets, outside of which are a few domes and tombs. The streets are wide, the houses stand at a considerable distance from each other, are built of limestone and coralline, and have huge hanging windows. There is a large market-place, a custom-house, some white-washed mosques of a very simple form, and a few caravanserais. According to Burton, "there is an independent bearing about the people, strange in the East; they are proud without insolence, and look manly without blustering. Moreover, the population has a healthy appearance." Pop. between 6000 and 7000. See Burton's "Pilgrimage to El-Medīnah and Meccah" (1855).

YAMUNĀ, the modern Jamna, is one of the sacred rivers of the Hindus, mentioned as early as in the hymns of the "R'igveda." Bathing in it, especially where it falls into the Ganges, at Allahabad, was at a later period, and is now, supposed to have the efficacy of removing sin, because at Allahabad the god Brahmā is said to have performed a great horse-sacrifice—whence this place is termed *Prayāga*, literally, "sacrifice," or *Bhat'sa-Prayāga*, literally, "the best sacrifice." (Though Allahabad, which is a celebrated place of pilgrimage, is the *Prayāga*, this term is also applied to other places where two sacred rivers meet, four of which, situated at the confluence of the Ganges with the Alakanandā, Pindar, Maudākīnī, and Bhāgirathī, are, besides Allahabad, held in especial sanctity, and severally called *Nandā*, *Karnā*, *Rudrā*, and *Devā-Prayāga*.) In the Purāṇic mythology, the Y.—in Sanscrit, a word in the feminine gender—is called a sister of the god *Yama* (q. v.); and a legend is also told in regard to her, according to which Balarāma, the brother of Kṛishṇa (see *VISHṆU*, the 8th Avatāra), once ordered the river to come to him, and as she disobeyed his bidding, plunged his ploughshare into her banks, and dragged her to him. Y., the legend continues, was thus compelled to quit her ordinary course, and to follow Balarāma whithersoever he went. At last, however, appeased by her entreaties, he let her go, after she had watered all the country. Professor Wilson appends to this legend, where occurring in his translation of the

"Vishu'u-Purān'a," the following remark: "The legend probably alludes to the construction of canals from the Jumna, for the purposes of irrigation; and the works of the Mohammedans in this way, which are well known, were no doubt preceded by similar canals dug by order of Hindu princes."—"Vishu'u-Purān'a" (Lond. 1846, p. 573).

YANG-TZE KIA'NG, "son of the great river" or "sea," the principal river of Asia, the "girdle of China," connecting together all the central provinces of that empire situated between Tibet and Kokonor on the west and the Pacific Ocean on the east. Its entire length through all its numerous windings, under its various names, can hardly be less, but rather more than 8000 miles. If regard be had to its tributaries and to the cities to which its waters give access, to the richness of the soil, and the variety of the products along its banks, and above all to the vast population scattered far and wide over the valleys, and plains, and hill-sides drained by it and its continents, the Y. has no equal on the globe. It takes its rise in the same elevated regions of Central Asia which give birth to the Brahmaputra, Mekong or Mekong, Salween, and Hwang-ho or Yellow River. Its course at first is southward, winding its way through an apparently level country, and bearing the name *Mura Ussu*, or Tortuous Waters. The magnitude of the stream must be considerable even in these upper regions, for it was here, beyond the Bayen Khara Mountains, that the missionary traveller, M. Hue, in the winter of 1845, saw a herd of wild oxen that had perished, having got frozen up in the ice while attempting to cross the river. Leaving these upper regions, after traversing the wide territory of Kokonor, the Tortuous Waters run southward, and enter the province of Yun-nan at about 28° n. lat. The river then flows in a south-east direction through this province, and at about 26° n. lat. and 108° e. long., it turns north, forming part of the boundary between the provinces of Yun-nan and Sze-chuen. After entering the latter province, it flows in a north-east direction under the name of *Kin-sha-kiang* (River of Golden Sands), receiving at this part of its course many tributaries. On the south, the tributaries of the provinces of Yun-nan and Kwel-chow are numerous, but not large; the principal one, the Oo or Woo, flows through the latter. On the north, the tributaries are numerous and large, the principal being the Ya-loong, the Miu or Wen, and the Kia-ling, which force their way through narrow passes, rolling over lofty precipices, and carrying with them large masses of ice. Two of these rivers are each more than 1000 miles in length. It enters the province of Hu-pe at about 110° e. long., shortly before which it receives the name of *Ta-kiang* (Great River). The Great River next runs east-by-north through the entire length of the province of Hu-pe, receiving in its progress the waters of many lakes and rivers, the principal being the *Han-kiang*, from which the most illustrious dynasty takes its name, which in turn gave to Chiuamen the name of which they are most proud—Sons of Han. The two provinces Hu-pe and Hu-nan—i. e., "North of the Lakes" and "South of the Lakes"—contribute, by natural or artificial channels, to augment the main stream. One of these lakes, the Tung-ting-hu, is the largest in China, having an area of 900 sq. miles. After receiving the waters of these lakes, the river proceeds in a north-eastern course through the province of Ngan-hwui, in which part are situated the cities forming the great mart Han-kow. Skirting the north of the province of Keang-se, it receives the waters of the Po-yang Lake, which receives nearly the whole of the waters of the province of Keang-se, and, like the Tung-ting-hu, pours all its contents into the Great River. Thence moving in a north-east direction, it becomes broader and deeper as it traverses the province of Ngan-hwui, receiving tributaries from both banks. Entering Keang-su, and passing Nankin, it travels southwards, intersecting the "Transport River" or Yun-ho—i. e., the Grand Canal. Through the whole of this province it receives tributaries, helping to swell the flood of waters, till in one broad expanse, several miles in extent from north to south, they disembogue into the Yellow Sea. To name the cities on the banks and tributaries of this rival of the Mississippi, would be to enumerate a large portion of the cities of the empire. It is navigable by ships of the largest class to 900 miles from its mouth, and for smaller vessels to upwards of 1600 miles. There is a large steam traffic on it up to Han-kow, nearly 700 miles from its mouth. By the treaty of Tien-tsin, the Y. was opened to foreign commerce as far as Han-kow; and speedily English and American steamers were found plying between Shanghai and Han-kow.—Dr Bridgman in the "North China Herald."

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YANINA. See JANINA.

YAN'KEE, Yankee Doodle. Yankee, the popular name for a New Englander in America, and in Great Britain often applied indiscriminately to the whole population of the United States, was in its origin a corruption of the word *English* as pronounced by the Indians (Yenghies, Yaughies, Yankces). It seems to have been first applied about 1775 by the British soldiers as a term of reproach to the New Englanders, who themselves afterwards adopted it.—Since the War of Secession, the Southern population apply it to the Northern people generally.

The air known as "Yankee Doodle" was originally "Nunkee Doodle," and is as old as the time of Cromwell, to whom, under that name, the doggerel words belonging to it seem to have had a reference. It was known in New England before the Revolution; and one account of its appropriation in America, as a national air, is that after the battle of Lexington, the brigade under Lord Percy marched out of Boston, playing it in derisive allusion to the then popular nickname of the New Englanders; and that afterwards the New Englanders, saying that the British troops had been made to dance to "Yankee Doodle," adopted the air as they had adopted the nickname. The citizens of the United States do not now recognise "Yankee Doodle," but "Hail, Columbia," as their national air.

YA'POCK (*Cheironectes palmatus*), a marsupial quadruped of the Opossum family, *Didelphidae*, the only known species of its genus. It differs from the opossums in only having five molars on each side of each jaw, in its aquatic habits, and its incapacity for climbing trees; the muzzle is rather sharp; the ears naked and rounded; the tail long, scaly, and prehensile; the feet webbed; the hind-feet with an opposable thumb. The Y. inhabits Brazil and Guiana. It is rather larger than a rat. It is of a brown color, with three transverse gray bands, white on the under parts. It feeds on crustaceans, fishes, &c. It has cheek-pouches, in which it stows away its food.

YAR, or Yare, a river of the county of Norfolk, rises about the middle of the county, flows east past Norwich, and, receiving the Waveney, widens into the estuary of Breydon Water, is joined by the river Bure at Great Yarmouth, $2\frac{1}{2}$ miles below which it enters the North Sea, after a course of about 30 miles.

YARD (A.-S. *geard*, *gyrd*, Ger. *gerie*, a rod or wand), the British standard measure of linear dimension (see WEIGHTS AND MEASURES), is subdivided into feet and inches. The yard contains 3 feet, and each foot 12 inches. The terms "yard" and "ell" (the ell being, however, equivalent to $1\frac{1}{2}$ yards) are frequently (*commonly*, according to Records) used synonymously by old authors.

YARD, in the rigging of a ship, is a timber which, when in its normal position, is borne horizontally at right angles to the ship's length at one of several heights on a mast, for the purpose of sustaining and spreading a square sail. It is upheld by the "lifts," and trimmed out of its right angle to suit the wind by the "braces." The lower sails or courses are upheld by the main, fore, or mizzen yards. Above these are the topsail-yards, the topgallant-sail-yards, and the royal-yards.

YARKA'ND, the commercial capital of Eastern Turkestan (pop. not less than 155,000), is situated in $38^{\circ} 24'$ n. lat., and $77^{\circ} 14'$ e. long., near a river of the same name. Until Y. was visited by Mr Shaw, in 1868, we had little reliable information concerning it. He found it to contain long streets, covered in against the rays of the sun, with rows of fine shops, in which goods of every sort, and from every country, were exhibited. He found the bread excellent; the supply of vegetables varied and abundant; the butchers's shops well provided with horse-flesh, camel beef, and mutton—the last two least prized, selling at 1d. a pound. The population seemed industrious, orderly, well skilled in many of the arts of civilised life, and in the enjoyment of security for life and property.—See Shaw's "High Tartary, Yarkand, and Cashgar" (1871); and Dr G. Henderson's "Lahore to Yarkand" (1873).

YAR'MOUTH, Great, a municipal and, until 1867, when it was disfranchised for corruption, a parliamentary borough returning two members to parliament, an important seaport, and fishing and sea-bathing town, on the east coast of Norfolk, 19 miles directly east of Norwich, and $20\frac{1}{2}$ by railway. It stands about $2\frac{1}{2}$ miles above the mouth of the river Yare, on a slip of land about a mile and a half broad,

washed on the west by the Yare, and on the east by the North Sea. Between the town and the suburb of Southtown, or Little Yarmouth, on the right bank of the Yare, in Suffolk, communication is established by means of a bridge. Connected with Southtown is the village of Gorleston, near the mouth of the river. The principal streets of Y. run parallel to the river, and are intersected by 156 cross lanes or "rows," which, as a rule, are so narrow as to be impassable for ordinary wheel-carriages, being generally not more than from 5 to 8 feet wide. The vehicles by means of which traffic is carried on in the rows, are called "Yarmouth carts." They are low, narrow, and well suited for conveying heavy goods. A quay of nearly two miles runs along the river, and here are the town-hall, the council-chamber, and several other handsome buildings—the finest houses, however, being those built along the esplanade on the beach. There are many churches, schools, and other public buildings, including a sailor's home, fisherman's hospital, and military asylum, the principal church being that of St Nicholas, founded in the 13th c., a handsome cruciform building with a tower and spire 168 feet high. The town also contains a monumental column 144 feet high, to the memory of Nelson. On the coast are several batteries, three piers, besides two at the harbor mouth, several public gardens, and a marine drive and promenade 2 miles long. Vessels of over 200 tons can enter the harbor, which is formed by the Yare. Y. is the principal seat of the English herring-fishery, which employs 250 luggers and over 5000 hands; deep-sea fishing, the produce of which is forwarded daily to London, is also carried on, and employs many hands. The curing of fish, especially of herrings, is important, there being consumed for this purpose about 10,000 tons of salt annually; and the "Yarmouth bloater" is highly esteemed in London and throughout the country. The quantity of fish sent from Y. by railway in the year 1864 was 34,432 tons. An extensive export trade in agricultural produce, herrings, and malt is carried on. Coals, timber, wines, and salt are imported. Ship-building is carried on, and a manufacture of crape and silk goods. In 1875, 1306 vessels, of 152,886 tons, entered the port, and 666, of 79,441 tons, cleared. The coast is dangerous, but Yarmouth Roads, which extend between the coast and a line of sandbanks a short distance off shore, are a safe anchorage. Pop. (1871) 41,819.

YARN. The name applied to the thread spun for the purpose of weaving cloths of various kinds. It varies not only in the materials of which it is made, but also in the fineness to which it is spun. This latter quality is of great importance, as upon it depends entirely the evenness and quality of the manufacture. In order that uniformity may be insured, a pound of the material is taken as the standard, and this is divided into *hanks* or *cuts*. Thus, with linen yarn, a hank or cut consists of 800 yards; and if it takes 25 of these hanks to make a pound, the yarn is called 25s; and if 40, 40s; and so on. A hank of wool or cotton consists of 840 yards. No material admits of such fine spinning as cotton. Messrs Thomas Houldsworth & Co. of Manchester have probably produced the finest—that is the thinnest—cotton yarn ever seen; they have produced 700s, of which muslin has been made, and this is the finest ever woven; but to test the wonderful perfection of their machinery, they have produced yarn too fine to be exactly estimated, but believed to be No. 8000 or No. 10,000; or 10,000 hanks, each 840 yards, from one pound of cotton—or over 4000 miles in length.

YAROSLAV. See **JAROSLAV.**

YARROW. See **ACHILLÆA.**

YARROW, a Scottish stream, rendered famous by song and ballad, rises a little over a mile east of Loch Skene, at the place where the counties of Dumfries, Peebles, and Selkirk meet. It flows in a general north-east direction through Selkirkshire, and joins the Etrick about two miles above the town of Selkirk, after a course of 25 miles. About $3\frac{1}{2}$ miles from its source, it expands into the Loch of the Lowes, which is a mile long, and a quarter of a mile broad. Leaving the Loch of the Lowes, the small stream enters St Mary's Loch, separated by a narrow neck of land, on which stands St Mary's Cottage (Tibby Shields?), from the other and smaller lake. St Mary's Loch is $8\frac{1}{2}$ miles long, and nowhere broader than 7 furlongs. The peaceful grassy hills which surround the loch slope downwards to the water's brink, uninterrupted by trees, and

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compose a scene of great quietude, over which broods the spirit of "pastoral melancholy." The prevailing calmness of the waters is pictured by Wordsworth in the lines :

" Let
The swan on still St Mary's Lake
Float double, swan and shadow."

YĀSKA. See NIRUKTA.

YAW, in the motion of a ship or boat, is the term for describing an irregular deviation in the course steered. A very chopping wind or sea may produce this effect, but the helmaman would usually have the credit of bad steering.

YAWL, a decked boat having two masts, on the first of which is a lugsail and topsail; and on the aftermost, which rises almost from the sternmost, a driver or fore-and-aft sail. It is a very easily managed rig.

YAWNING may be either the simple result of deficient aëration, or may be brought on by the mere sight of the act in another person, and is a modification of the ordinary movements of respiration, in which the inspiration is deeper than usual, and is accompanied by a kind of spasmodic contraction of the muscles which depress the lower jaw, and by a great elevation of the ribs and to some degree of the shoulder-blades. "The purely involuntary character of the movement," says Dr Carpenter, "is sometimes seen in a remarkable manner in cases of palsy, in which the patient cannot raise his shoulder by an effort of the will, but does so in the act of yawning. Nevertheless, this act may be performed by the will, though not completely; and it is one that is particularly excited by an involuntary tendency to imitation, as every one must have experienced who has ever been in company with a set of yawners."—"Principles of Human Physiology," 8th ed., p. 280.

YAWS, known scientifically as *Frambæsia*, is a cutaneous eruption of a very peculiar nature, which commonly attacks negroes, but has been noticed in Europeans. The disease is preceded by languor and pain in the limbs, and shivering, succeeded by heat and restlessness, and is more severe in children than in adults. After a few weeks, the pure glossy-black color of the skin gives place to a dirty dull tint; and the patients often not only loath food, but take to eating coals, chalk, earth, &c. The skin is then covered for a few days with a white mealy scurf, as if it had been dusted with flour, after which pimples like pin-heads appear on the forehead, face, neck, groins, &c., which increase for a week or more, growing into crusted pustules, which enlarge until the base attains the size of a sixpence, or even a shilling. If the crust is removed, a foul sloughing sore is exposed. The pustules may, however, burst spontaneously, and discharge a thick viscid matter, which hardens to a scab on the surface. In the larger pustules, this surface at length becomes elevated into a red granulated excrescence, not unlike a wild raspberry (*Frambæsia*), which is the true and characteristic yaw. In size, it may vary from that of a pea to that of a mulberry, and in color it varies with the general health of the patient from a red to a pale white tint. It has very slight sensibility, and never properly suppurates, but discharges a glutinous fluid, which communicates the disease by inoculation. When the yaw has remained for some time, it diminishes in size, and as the pustule heals, is finally covered with skin, leaving little or no mark. When the disease seems to have reached its height, one pustule becomes much larger than any of the others, and instead of being elevated, is depressed. This is termed the master or mother yaw, and requires much care. When the mulberry-like excrescences appear on the soles of the feet the resistance of the thick epidermis excites great pain. They are then termed by the negroes *Tubbes*, or crab yaws. This disease is endemic among certain tribes of native Africans, and is common among the negroes of the West Indies and of North and South America. It is contagious, and cannot be communicated except by the actual contact of yaw-matter to the abraded skin, or by inoculation, which is sometimes effected by means of a large fly called the yaw-fly. The interval between the reception of the poison and the formation of the eruption varies from seven to ten weeks. The disease scarcely ever attacks the same individual more than once. "Yaws," says Dr Craigie, in his learned work on "The Practice of Physic," "are liable to be confounded with the secondary [tertiary?] or

cutaneous symptoms of syphilis, with sivvens,* with the Arabian leprosy, with radesyge, pellagra, and the red leprosy of Cayenne." Several writers of eminence regard yaws as the same with the disease described in Leviticus, chap. xiii., as the Jewish leprosy, but the description of the symptoms there given is not sufficiently precise to furnish satisfactory evidence regarding their identity. With regard to treatment, mercury does more harm than good, and all that can be done with advantage is to render the progress of the morbid processes as little painful as possible. The most important remedial agent is the warm bath; and blood-purifying drinks, such as decoction of sarsaparilla, &c., may be prescribed. The Africans have their own native remedies in the bark of trees called *Yugo* and *Bullanta*, taken in infusion or decoction; and to destroy the mother yaw, they adopt the following barbarous process: Iron is boiled in lime-juice with a quantity of the common black ants and of Malaguetta pepper, and the liquid thus prepared is applied hot to the yaw.

YAZOO', a river of Mississippi, U. S., formed by the union of the Tallahatchie and Yallobusha, runs south and south-by-west in a very serpentine course, in a deep, narrow, sluggish channel, between fertile cotton plantations, and empties into the Mississippi River, 12 miles above Vicksburg; it is 200 miles long, and navigable at all seasons.

YEA'DON, a town of the West Riding of Yorkshire, England, six miles north-north-east from Bradford. It stands on a hill, on the left side of the valley of the Aire. It has considerable woollen manufactures. Pop. (1871) 5246.

YEAR, a division of time containing a complete course of the seasons, and depending upon the revolution of the Earth (q. v.) round the sun. Its duration was variously determined by the nations of antiquity, the earliest method being the conventional one of making it include a certain number of lunar months; the lunar month being, after the day, the first period of time which was fixed. Twelve lunar months, giving a year of 354 days, were first taken as a near approach to a course of the seasons. This, though a pretty close approximation to the true value of a year, was yet so incorrect (being defective by more than eleven days) that it was soon found to be necessary to intercalate these eleven days, in order to preserve the year in a constant relative position to the seasons. The intercalation was variously effected: thus, the Egyptians, who knew the year of 365 days previous to 1500 B.C., divided it into three seasons ("Winter," "Summer," and "the Nile," i. e., the inundation of the Nile) of four months each, made each month contain 30 days, and introduced five intercalary days at the end of the 12th month; the Greeks, who generally retained the lunar year of 354 days, added 3 months in the course of every eight years, giving an additional month to the third, fifth, and eighth year of each cycle; the Romans also added additional days, but their system of intercalation was continually changed, not always for the better, till Julius Cæsar caused the adoption of the solar year. The Romans likewise abolished, in Asia, Egypt, and all the other countries under their sway, the old method of reckoning by lunar years, and compelled the adoption of the Julian calendar, according to which the year was assumed to contain 365 days 6 hours. The substitution of the Gregorian Calendar in the 16th c. introduced for the average length of solar year, 365 days 5 hours 49 minutes, which differs only by a few seconds from its true value; and this small annual error, as well as the excess of the true year over the year of 365 days, is compensated for by means of a succession of *Leap-years* (q. v.).

The time at which the year began varied much among different nations. The

* As Sivvens or Sibbens, and Radesyge, are diseases not much known to the general public, and not noticed in this work, we may mention that sibbens is a tubercular affection of the skin, often extending to the deeper tissues very infectious, and said to be endemic in Dumfriesshire, Ayrshire, and Galloway, first described about a century ago by Dr Ebenezer and Gilchrist; while the Radesyge, Spedalskhd, Spedalska, Liktraa, Northern Leprosy, or Marsh Sickness, is endemic in various parts of Scandinavia, consisting in its fully developed form of "an eruption of pimples, scales, patches, and tubercular pustules on the skin, terminating in pusiform discharge, with or without ulceration."—Craigie, *op. cit.*, vol. i. p. 690.

Carthaginians, Egyptians, Persians, Syrians, and other eastern peoples commenced their year at the autumnal equinox, at which time the civil year of the Jews also began, though their sacred year was reckoned from the vernal equinox. The commencement of the Greek year was at the winter solstice before Meton's time, and was then changed to the summer solstice. The Romans were the first to adopt the 1st day of January as the first of the year, but their example was not followed by subsequent European nations for some time. In France, the commencement was 1st March under the Merovingians, 25th March under the Carolingians, Easter under the Capetians, and 1st January from 1564. The ecclesiastical year in Europe generally commenced on 25th March (see DATE.) The ancient northern nations reckoned their year from the winter solstice; the Russians, till Peter the Great's time, from 1st September, and the same reckoning, known as the Byzantine era, was in use in the Eastern Empire. Of necessity, the commencement of the year among Mohammedan nations has no fixed position in relation to the sun's course or the seasons, it being invariably a lunar year. In Astronomy, there are several kinds of years depending upon the various configurations of the earth in its orbit, and consequently varying in length. First, there is the *tropical*, or (as it is sometimes incorrectly called) *solar* year, which, from its being recognised in legislation and history, and commonly applied in the measure of time, has also received the name of *civil* year. This year is defined as the time which elapses from the sun's appearance on one of the tropics to its return to the same, and has a mean length of 365-2422414 mean solar days, or 365 days 5 hours 48 minutes 49-7 seconds (see PRECESSION). Next is the *sideral* year which is the period required by the sun to move from a given star to the same star again, and this year, affected as it is by Nutation (q. v.) only, is one of the most invariable quantities which nature presents us with, and has a mean value of 365-2563612 mean solar days, or 365 days 6 hours 9 minutes 9-6 seconds. The time which elapses between the earth's arrival at its Perihellion (q. v.) and its return to the same position, is known as the *anomalistie* year, and is equivalent to 365-2595981 mean solar days, or 365 days 6 hours 18 minutes 49-3 seconds. The *sideral* and *anomalistie* years have a merely astronomical importance.

YEAST. In the process of fermentation of saccharine fluids containing albuminous matter; as in brewing or wine-making, the originally clear fluid becomes turbid, carbonic acid is evolved, and the substance causing the turbidity gradually separates in a grayish foaming mass of a blitter taste and an acid reaction. This is yeast; and on examining it under the microscope, it is found essentially to consist of aggregations of small oval cells of a vegetable nature, known as the yeast-cells, yeast-plant, or *Torula cerevisiæ* (q. v.). Yeast, as is well known, has the property of setting up fermentation in saccharine solutions; and beer-yeast, the kind with which we are specially acquainted, possesses, according to Professor Miller, this power in the highest degree, as may be shown by dissolving 4 parts of pure cane-sugar in 20 parts of water, and adding 1 part of fresh yeast: if this mixture be exposed to a temperature of about 80°, in less than an hour fermentation will have commenced. The investigations of Mitscherlich have led chemists to distinguish two varieties of yeast—viz., the *Ober-kefe*, or surface-yeast, and the *Unter-kefe*, or sediment-yeast, the former collecting on the surface of the fermenting fluid, and the latter forming a sediment. Surface-yeast is propagated by buds (see *TORULA CEREVISIÆ*) and sediment yeast by spores; and each variety produces specific results upon the fermenting fluid. The fermentation induced by the surface-yeast is rapid and irregular; while that produced by the sediment-yeast is slow and quiet. The surface-yeast is formed when the saccharine fluid ferments at a temperature of from 65° to 77°; while the sediment-yeast is chiefly produced when fermentation takes place at the lower temperature of from 33° to 45°. In their chemical relations, the two varieties present no apparent difference. On treating yeast with a solution of potash, a cellulose-like substance remains, while an albuminate is dissolved. The action of yeast is destroyed by exposing it to a temperature of 212°, by alcohol, by the strong mineral acids, chlorine, iodine, and bromine, oxide of manganese, creasote, &c.; on the other hand, it may be dried at a low temperature, or by pressure, and may be preserved in this state without losing its activity. The part which the globules of yeast play in exciting the conversion of sugar into alcohol and carbonic acid, is very obscure; but an experiment of Mit-

scherlich seems to shew that the sugar ferments only in those points which are in actual contact with the globules. Pasteur's experiments render it probable that the process of fermentation is connected with the assimilation of the sugar by the yeast-plant during the development of the yeast-globules, or, in other words, that "the essential condition of fermentation is the conversion of albuminoid matter into organised globules."

According to Mitscherlich's analysis, the cells of ordinary washed yeast in a condition to excite fermentation contain (the ashes being deducted): carbon, 47.0; hydrogen, 8.6; nitrogen, 10.0; sulphur, 0.6; oxygen, 35.8; while spent yeast (after fermentation had ceased) contained only 5 of nitrogen. The inorganic matter amounted to 7.3 per cent. of the dried yeast, and consisted entirely of phosphates.

The economic uses of yeast in bread-making, brewing, &c. are noticed in other articles. Beer yeast (*Cerevisia fermentum*) is an article of the British Pharmacopœia. It is employed as a stimulant in the advanced stages of low fevers, and is especially serviceable in cases where, in consequence of inflammatory symptoms, wine is inadmissible. Neillgan has found it of great service in intense typhus following parturition. The dose is two table-spoonfuls every three hours, and it may be given in camphor mixture or peppermint water. Yeast poultice forms an excellent stimulating application to foul and irritable sores. It is composed as follows: Take of yeast, six fluid ounces; flour, fourteen ounces; water heated to 100°, six fluid ounces. Mix the yeast with the water, and stir in the flour. Place the mass near the fire till it rises. This poultice should be renewed every six or eight hours. Its special efficacy depends upon the carbonic acid gas which it evolves.

If surface-yeast or under-yeast be collected and placed on a cloth to drain, and then pressed until nearly dry, it can be kept with care for several months, and in that state is what is called GERMAN YEAST, for which a large trade has sprung up within the last few years; the imports to Britain from the continent having amounted in the year ending 31st December 1875, to 168,521 cwts., or about 81½ tons. It is chiefly imported from Holland and Hamburg, and is obtained mostly from the great continental distilleries. Nearly the whole of this large quantity is consumed by the bakers. PATENT YEAST is exactly similar, but is raised from a wort made purposely from malt and hops. ARTIFICIAL YEAST is a dough of wheat or other flour, mixed with a small quantity of common yeast, and made into small cakes, which are dried. If kept free from damp, it long retains its fermentive power.

YE'DO ("River Door"), since 1868 called To-Kio ("Eastern Capital"), the chief city of Japan, is situated in the east of the island of Nipon, at the head of the bay of the same name, in lat. 35° 40' n. and long. 139° 40' e. The river O-gawa, or Great River, divides it into two parts, an eastern called Hondo, and a western or Y. proper. The former is, strictly speaking, an island about 7½ sq. m. in extent, the boundaries of which are: on the south, the bay of Y.; on the west, the O-gawa; on the north, a large canal; and on the east, a river running parallel to the O-gawa. It is traversed by several canals, which divide it into eight principal districts, containing upwards of sixty temples, of which the most notable are the *Yotaka Laban* (or temple of 500 images), and the temple of *Hadeuma*, the Japanese "God of War;" numerous palaces of the once-formidable daimios, now rapidly undergoing demolition; and various government stores. Hondo is connected with Y. proper by four bridges, of which the largest, O-basi or Great Bridge, is 250 yards in length. Under the Tycoon, Y. proper was divided into three parts—(1) Siro, or the castle; (2) Soto-Siro, or outside the castle; and (3) Midai, town and suburbs. The *first* of these contains what was the residence of the deposed emperor, with numerous palaces, once occupied by the higher daimios. The *second*, which engirdles the first, and reaches to the river O-gawa, is partly occupied with palaces and temples, the more eastern part intersected by the Tocaldo or great high-road of Nipon forming the mercantile quarter of the city. One of its numberless bridges is called the Nipon-basi or "bridge of Japan," and is considered the centre of the empire, all geographical distances being reckoned from it. Of the temples in the second division of Y. proper, the chief are those of Monzeki, the greatest of the Buddhist temples, and Sanno, the greatest devoted to the old or primitive religion of Japan. The *third* division is rather vague, and is, or was, used to comprehend all of Y. not

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included in Siro and Soto-Siro. It forms the exterior part of the city, and contains, among others, the temple of Qunnon, one of the most beautiful, venerated, and frequented in all Japan; of Amida; of Confucius, which also forms the native university of Y.; and of Kanda, the tutelary deity of the city, which is remarkable for the vast extent of its outworks. Here also is the *Yostwara*, or Court of Public Women, a district of considerable size, and occupied exclusively by the class indicated by the name.

The temple of Qunnon perhaps merits a special description. Before one arrives at the long avenue which leads to it in a straight line, he passes through a large portico, the pillars of which are beautifully varnished with red. This varnish, though exposed to all the changes of the air for so many years, has lost nothing of its brilliancy. In the middle of the portico is suspended an enormous lantern, the largest, one may say, that ever was made. The avenue leading to the temple is lined with shops, in which are exposed all sorts of articles, religious and profane, to be sold to the numberless pilgrims who every year visit this sacred spot. The building is elevated about 20 feet from the ground. A grand flight of steps gives access to the interior. The arrangement of this, like that of almost all other Buddhist temples in Japan resembles very much that of the interior of Catholic churches. First, you have the chief altar at the extreme end of the temple, with side chapels at its right and left; next, a great number of wooden images, with the "glory" round their heads, like the images of Catholic saints; then there is generally seated at the door of the temple a man selling rosaries and holy pictures. In the side chapel, at the left of the chief altar, may be seen a well-sketched picture, representing some of the prostitutes of Y. who have been celebrated for their beauty.

The population of Y. has been set down by various writers on Japan at from 1,500,000 to 3,000,000, but according to her Majesty's vice-consul at Y., even the lowest of these estimates is a great exaggeration. In his Report, dated February 15, 1872, he states, on the authority of the Tokel-Fu, or municipal government of the city, that, "according to the last census taken since the restoration (i. e., of the Mikado in 1871), the population consisted of 780,321 souls in all." The area covered by the capital, however, is about 28 sq. m.; and therefore Y., in point of extent, is after London the largest city in the world. Its site is no doubt one of peculiar beauty. The broad valley in which it lies slopes gradually to the waters of the bay, and for leagues around are wooded hills, smiling valleys, and an ever-luxuriant vegetation, evergreen oaks, cryptogamia, conifers, in great variety; the cypress, the palm, and the bamboo. In the official quarter, parks with magnificent trees, temple gardens, and broad green slopes gladden the eye; while in the suburbs are hedgerows and shady lanes, clothed for the most part with evergreen vegetation. But the abolition of the feudal system has produced, and is still producing, important changes in the general aspect of the city. The palaces of the ex-daimios are being, as has been said, gradually demolished, and their grounds, so far as not required by the new government of the Mikado, are being used as vegetable gardens, and as mulberry plantations. From this decay, even the late imperial castle itself, and the magnificent mausoleums of the Tycoons, are not exempted. The Report from which we have already quoted says: "Thus that portion of the palace called the citadel threatens soon to become a mass of ruins. Already the imposing and numerous gateways and bridges leading to it are left to take care of themselves, and a foreigner, who a few years back hardly dared look at this wonderful stronghold, may now freely ascend its towers, overlooking the residence of the Mikado, without meeting even a gate-keeper. . . . The ex-daimios, since they became dispossessed of their estates, have hastened to part with what they no longer considered necessary to their dignity. Thus all the costly articles of furniture and ancient arms which once adorned their princely dwellings, may now be seen in the shops of dealers in antiquities, and may be bought for a mere trifle. Many of these nobles have availed themselves of the leave given to them by the Mikado to travel abroad." In regard to their style of building, the vice-consul states that the Japanese have made little progress. Although there are large fireproof depots, protected by a thick coating of stucco, and rising high above the ordinary shops, and although patrols march constantly through each ward night and day, to give timely alarm of fire, "yet fires have been as frequent during the winter (1871—1872) as ever, and thousands of wooden dwellings thus destroyed are being

rebuilt of the same inflammable material, and in the same shabby style." A strong desire for education is springing up among the people of Yedo. Schools for instruction in English, French, and German have been established; and great progress is also being made under European teachers in medical science. The native garrison, which is really the Japanese army, is equipped and drilled after the French fashion, and is armed with chassepots. The imperial navy is also being organized after the model of the British, and numbers several iron-clads. Telegraphic wires are in use throughout the city. As yet no definite statistics can be got of the trade of Y., but from the consular report of 1872, it seems to embrace most of the products of European industry, while it largely exports silk, silkworms' eggs, copper, lacquer-work, mats, timber, &c. Most of the goods pass through the port of Yokohama (q. v.), with which Y. is connected by railway.

Sir Rutherford Alcock's "Capital of the Tycoon" (Lond. 1863); Oliphant's "Narrative of the Earl of Elgin's Mission to China, 1857, 1858, and 1859" (Lond. 1860); "Yeddo and Peking," by Robert Fortune (Lond. 1868); "The Treaty Ports of China and Japan" (1867); "The Consular Reports for 1870-1878;" and Mossman's "New Japan" (1873).

YEDO, Bay of, an inlet of the North Pacific, on the south-east coast of the island of Nippon, Japan, lying between 35° and $35^{\circ} 40'$ n. lat., and intersected by the 140th meridian of e. long. The city of Yedo is situated at its north-western extremity. The depth of water, nowhere great, decreases all along the banks, towards the town, which, at low water, cannot be approached within a mile even by a boat. Solid batteries of granite, well kept, and in general aspect not unlike those of Cronstadt, have been erected midway between the anchorage and the shore.

YEKATERINBURG. See **EKATERINBURG.**

YELATOM. See **JELATOM.**

YELL, one of the Shetland Islands (q. v.), and, after Unst, the furthest north of that group, is separated from the mainland by Yell Sound, and from Unst by Blue Mull Sound. It is 17 miles in length, $5\frac{1}{2}$ miles in average breadth. Area, 94 sq. m.; pop. (1871) 3732. The west coast is rocky and precipitous, but on the whole the surface is tame, and consists largely of moorlands—the greatest elevations being no more than 400 feet above sea-level. Agriculture is in an unusually backward state, and, though the surrounding seas are generally stormy, fishing is the chief employment.

YELLOW BERRIES. See **FRENCH BERRIES.**

YELLOW-BIRD (*Chrysomitris tristis*), a bird of the Finch family (*Fringillidae*), a native of North America, where it is very widely distributed. It is rather more than five inches in entire length; the male in summer plumage is of a bright yellow color, with black crown, wings, and tail, the upper and under tail-coverts white. The female is yellowish brown above, and ashy brown below; and the male assumes a very similar plumage in winter. Yellow-birds are often seen in large numbers, feeding on seeds of thistles and other plants, and seldom alighting on the ground. The nest is made of lichens fastened together with saliva, and lined with soft substances. The song of the Yellow-bird is very pleasing; and it is a sprightly and attractive cage-bird, easily tamed, and capable of being taught tricks. Several allied species are found in the western parts of America.

YELLOW COLORS. The yellow pigments employed by painters are: 1. The varieties of chrome prepared from chromate of lead. See **CHROMIUM**. 2. Several colors technically called *pinks*—as *Brown Pink*, prepared as a lake from a decoction of French berries and fustic; and *English Pink* and *Dutch Pink*, both lakes, prepared by different processes from French or yellow berries and turmeric. 3. *Naples Yellow*, a mixture of metallic antimony, red-lead, and oxide of zinc calcined, added to a small quantity of lime, then fused, and afterwards ground to powder. 4. *King's Yellow* is a ternary sulphuret of arsenic. 5. *Patent Yellow* consists of 28 parts of chloride of lead and 37 parts of carbonate of lead well mixed in powder, and then fused together. 6. *Weil's Yellow* is prepared from a decoction of *Weil's Reseda luteola*, or dyer's weed, with alum, and is, in fact, another yellow lake. It is much used in paper-staining. 7. *Gamboge*, which constitutes the chief yellow color used in water-color painting.

YELLOW FEVER is a disease endemic in low districts near the sea, but under other circumstances sporadic in other places, never appearing beyond 48° of north latitude, nor without a temperature of at least 72° F., nor above the elevation of 2500 feet above the level of the sea, depending in part on causes not yet known, but in circumstances favorable to its production, capable of being propagated by contagion. It usually commences suddenly (generally in the night or early morning) with a sense of coldness, a rigor, or actual shivering, followed by vascular reaction, as shewn by the heat and dryness of the skin, headache, especially over the eyes, and pain of the eyeballs, which are suffused, and have a strange drunk-like aspect. The limbs and joints are painful; the tongue is loaded, and its edges are red. There is a peculiar and characteristic flush or suffusion of the face, occupying a zone of about an inch above and below the eyes. Nausea, gastric uneasiness, and a tendency to vomit soon supervene. These symptoms may gradually lessen, and the patient will then regain his ordinary health in 24 or 36 hours; but if the symptoms persist, they soon become more aggravated, and the stomach ejects at first a clear fluid, which soon becomes of a dirty-brown tint, and is finally succeeded by the true *black vomit*. A yellow tint on the conjunctiva is observed, which extends to the skin of the face; and as the disease advances, the whole body becomes of a yellow color, varying in intensity from a pale lemon to a deep orange tint. The anxious countenance indicates the distress of the patient, who appears to be agitated by fearful apprehensions or lucid delirium. The skin feels constricted, and is of a pungent heat. The bowels are constipated, and the red, clean, and tremulous state of the tongue indicates the presence of intestinal irritation, and consequently the increase of danger. The urine and other excretions are more or less suppressed. Eructations, hiccupping, and vomiting increase the distress and weakness. The disease in fatal cases usually terminates on the second or third day. The above train of symptoms is by no means constant. Sometimes, when everything seems favorable, black vomit suddenly appears, and the patient immediately succumbs. In other cases, patients experience no symptoms except severe pains in the legs and suppression of urine, and die without taking to their beds. In all cases terminating fatally, albumen appears in the urine on the second or third day. In females, the catamenial discharge is sure to appear, whether due or not. The discharges from the bowels, towards the close of the disease, may be black or dark green, and these dark evacuations are succeeded by what is termed the "caddy-stool," resembling dark sandy mud. As yellow fever is not a disease of this country, we shall not enter more fully into its symptoms. According to Dr Jackson, who has written an excellent treatise on this disease, the usual course of yellow fever in its most concentrated form consists of 12 hours of forming period, 36 or 48 of formed or proper fever, and 24 or 36 of declining or concluding period. When the symptoms are less intense, the patient may survive to the 14th day. In the milder modifications of this disease, the morbid symptoms are prolonged to a considerable extent. Death may occur at any period of the disease, and the mode in which it occurs is by syncope (fainting), uræmia (or poisoning of the blood by the accumulation of urea), apoplexy, or asphyxia or suffocation. When the black vomit is plentiful, and the urine free, the intelligence remains unaffected, but the skin becomes cold and damp, the pulse small, and finally imperceptible at the wrist, and death ensues from gradual exhaustion and syncope. When the black vomit is scanty, and the urine is suppressed, the poisoned blood acts upon the brain, and the patient exhibits wild delirium, followed by coma, convulsions, and death. The ratio of deaths to cases in the disease is always very high. From Tillich's statistical Reports on the Diseases of Soldiers, it appears that in the Windward and Leeward command, the ratio was 1 to $2\frac{1}{2}$ (or 3 in every 7 cases died), in the Jamaica command it was 1 to $1\frac{1}{2}$ (or 3 in every 4 cases died), while in Gibraltar it was 1 to $1\frac{1}{2}$ (or 3 in every 5 cases died).

There are great differences of opinion as to the proper treatment of this disease. Dr Blair, one of the highest authorities on yellow fever, holds that the disease may be cut short or aborted by prescribing "20 grains of calomel added to 24 grains of quinine, afterwards followed by two drachms of carbonate of magnesia, and two ounces of sulphate of magnesia in eight ounces of peppermint water." These aborting doses were repeated at intervals of four or six hours, one dose being generally efficient, but four have been given before the quinine induced its special symptoms of cinchonism. Many physicians who have had much experience of this disease, have no belief

in the abortive treatment; and some treat their cases with antiphlogistic or lowering remedies, and others with stimulants. It is probable that there is no one mode of treatment suitable for all cases, and that each should be treated according to its special symptoms. The extreme heat of the surface (a temperature of 107° has been observed in the arm-pit) may be relieved by the frequent application of the wet sheet; cupping or leeches often relieve the head-symptoms; and a blister to the gastric region may relieve the irritation of the stomach. If there is no suppression of urine, and if that fluid is free from albumen, morphia is of great service, but it must be given with great caution. The food should be of the mildest form, such as chicken-tea, arrowroot, sago, and barley-water, and these should be taken frequently in very small doses, in consequence of the state of the stomach. Similarly, with regard to all drinks, which are most likely to be retained if sucked through a tube or given by tea-spoonfuls. Tea usually disagrees, but cold infusion of oatmeal, and very dilute brandy and water, are usually relished. Our highest authority on Tropical Diseases, Sir J. Ronald Martin, states that, whenever the disease breaks out, "the most speedy means of prevention [of its spreading] in respect to towns and garrisons, will always be found in the removal of both the sick and the healthy to a locality where the temperature is sufficiently low, such as a neighboring range, or dry ventilated ground." In all ships on service on the west coast of Africa and other unhealthy stations, the following rules (which we borrow from Dr Aitken's "Handbook of the Science and Practice of Medicine") should be strictly attended to. A prophylactic dose of quinine (five grains) should be administered to the men daily (a precaution that should be taken in all malarious regions, independently of yellow fever). Whenever the fever appears on board, the ship should at once put out to sea, and should proceed to the coolest atmosphere within reach. The most immediate measures of prevention should be, to obviate direct solar exposure, to prevent fatigue, and to check any excesses in the use of spirits. Seamen should be kept as remote from unhealthy coasts as is consistent with duty, anchoring every evening a few miles from the shore, if possible. Duties in boats should as much as possible be conducted during the mornings and evenings, the noon-day heats and the deadly nocturnal emanations being to be equally avoided. When men are landed, they should be encamped on high and dry ground. Meals should be regularly served and carefully cooked, and coffee should be given early in the morning, and after unusual fatigue or exposure, and no work should be commenced till the coffee has been taken. Holds of ships should not be cleansed on the spots where the fever has originated, or during its prevalence, but the process should be deferred till the vessel is in a colder latitude. Lastly, green wood should not be placed on board ship in hot climates, but the wood should be barked and partly charred.

Dr Craigie, in his learned "Practice of Physic," gives the following extensive list of synonyms of Yellow Fever: "*Febris lama, Typhus ecterodes, Sauvages* and Cullen; *La Maladie de Siam, La Fievre Matelotte, Vomito Prieto, Chapotonada, Fiebre Amarilla Hispanorum et Hispano-Americanorum*"; New Distemper of 1691; Kendall's Fever, Pestilential Fever, Billous Fever of Gamble; Enderial Causes or Burning Fever of Moseley; Malignant Pestilential Fever of Chisholm; Remittent and Billous Remittent of Hunter; Concentrated Endemic Fever of Jackson; Tropical Continued Fever of Lempriere." We shall conclude with a short notice of the history of this disorder. Long before the arrival of Cortes in Mexico, an extremely fatal epidemic disease used to prevail amongst the native Mexicans. Epidemics of special severity occurred in 1545, 1576, 1786—1787, and 1761—1762. Although Humboldt thinks that the elevation of the table-land of Mexico (7200 to 7800 feet above the level of the sea) is sufficient to exclude any idea of the identity of this disease, known as *Matlazahuatl*, with yellow fever, there can be little doubt, from the similarity of the symptoms, that the two diseases are really the same. The Europeans visiting the shores of America soon became painfully familiar with the disease; and it is almost certain that "the plague," which so often destroyed the English and Spanish troops at the end of the 15th and the beginning of the 16th centuries, was in reality yellow fever. A disease bearing the character of yellow fever appeared in 1618 among the Indians in certain parts of Massachusetts, and prevailed with much severity till 1632, and it committed great havoc among the emigrants to Virginia. When the expedition against Hispaniola in 1655, under Venables, returned to Jamaica, they met there "an enemy (the plague) more severe than the

Spauldars, which in a little time reduced the army, originally 7000, to fewer than 2000 men." There can be little doubt that this plague was yellow fever. In 1691, it was very fatal in Barbadoes, where it was known as the *Nova Distemper*. From about this date, yellow fever has been endemic in the West Indies. It was unknown at Carthage and along the coast till 1729, when it committed dreadful havoc; the Spanish galleons never remaining at any time without interring one-half, or at least one-third of their men. In 1740, it first appeared at Guayaquil, since which time it has often occurred; and in all the towns on the coast of the American continent and islands between 45° n. lat. and 10° s. lat., it appeared in proportion as Europeans began to visit them. "In this manner," says Dr Craigie, "Vera Cruz, Caiman, Havana, Acapulco, and La Guayra have successively become its endemic abodes; and its appearance in these towns is as uniform and certain as the arrival of the sun at the tropic of Cancer. Of these places, Vera Cruz and Havana may be regarded as the nursery of yellow fever; and from the mouth of March to that of September or October, the disease rages like a pestilence among the recently arrived Europeans, and those natives who descend from the elevated tablelands of the interior." Until the year 1798, the disease was regarded as having a spontaneous origin, and being due to tropical peculiarities operating on European and unseasoned constitutions; but that year the doctrine of infection suddenly started. In that year the disease appeared with great virulence in the island of Grauda, and rapidly spread over the Antilles to Philadelphia, and many parts of the state of Pennsylvania, to Massachusetts, New York, Caroline county Maryland, Alexandria in Virginia, several counties in North Carolina, and Caracas in Venezuela. This outbreak was preceded by a few days by the arrival of a vessel from Bulam, on the West African coast, at a harbor in St Granada, in which vessel, when stationed off Bulam, fever had prevailed about five months before to a great and fatal extent. This disease was at the time termed the Bulam fever, but soon turned out to be ordinary yellow fever. Since 1763, yellow fever has very often appeared as an epidemic in the West India Islands and various parts of the American states, and has even been endemic in various parts of the south of Europe, especially Gibraltar and Malaga. From the testimony of many medical writers, it is certain that a disease essentially identical with yellow fever prevails endemically along the west coast of Africa, at Senegal, Sierra Leone, Cape Coast Castle, and the island of Fernando Po. Fortunately for this country, this fell disease, which has repeatedly been brought to our shores (Swansea, Southampton, &c.), is at once eluded out by our climatic conditions. When, in 1866, it was imported into Swansea, Dr Buchanan, who was at once sent down by the government to watch the disease, and take the necessary measures to prevent it from spreading, recorded 19 instances in which, with filth, bad ventilation, and every other condition favoring the fever, it failed in every case to spread beyond the original victim. Altogether there were 20 cases, of which 15 were fatal. The disease then disappeared.

A disease closely resembling, but apparently not quite identical with yellow fever, committed great ravages in Mauritius in 1867.

YELLOW-HAMMER, or Yellow-Bunting (*Emberiza citrinella*), a species of Bunting (q. v.), which is one of the most common of small birds in Britain, distributed over all parts of the country, and is common also in most parts of the continent of Europe, from Norway and Sweden to the Mediterranean. It is about seven inches in entire length, and the male is a bird of brilliant plumage, although there is something in the short thick form of the bird, and in the tints and distribution of its plumage, which prevents it from being greatly admired for beauty. It is, perhaps, also the less regarded because it is so common; and in many parts of Britain there is a prejudice against it, so that boys who would think it wrong to rob any other bird's nest, esteem it a kind of duty to rob that of the yellow-hammer. In the summer plumage of the male, the head, cheeks, ear-coverts, and nape of the neck are bright lemon yellow, with a few dusky black patches; the upper part of the back and wings are reddish-brown, tinged with yellow; the wing primaries are dusky black, with narrow external edges of bright yellow; the secondaries, tertials, and wing-coverts dusky black, broadly margined with rich chestnut brown; the upper tail-coverts reddish chestnut, edged with yellow; the tail-feathers dusky black, the central pair edged with chestnut, and tinged with yellow; the chin, throat, and whole under

surface, bright lemon yellow, clouded on the breast and flanks with reddish brown. The tail is slightly forked, and is shorter than that of the Common Bunting. The knob in the palate is also less conspicuous. The female has much less yellow about the head than the male, and her plumage is altogether much less vivid. The Y. frequents hedges and low trees, and is often to be seen, especially in winter, in the vicinity of houses, in flocks, with sparrows, chaffinches, &c. It generally makes its nest on the ground, under shelter of a brush or a tuft of grass, forming it of moss, roots, and hair. The song of the male is very sweet, and consists of few notes, which have been jocularly set to music with the words, "*A little bit of bread, but no o cheese.*" He is remarkably attentive to his mate, and takes his turn in incubation. In Italy, great numbers of yellow-hammers are caught, and fattened like ortolans for the table. It is a curious and noteworthy circumstance, that this bird is rare in insular situations; in the islands of the Mediterranean, as well as the Orkneys. The name yellow-hammer is a corruption of yellow-ammer; *Ammer*, in German, signifying Bunting. In Scotland, the Y. is known as the Yoldriu or Yllic.

YELLOW RIVER. See **HWANG-HO.**

YELLOW SEA. See **WHANG-HAI.**

YELLOWSTONE, a river of the U. S., rises in a beautiful lake of the same name high up in the Rocky Mountains, and receiving numerous branches from the south, flows north-easterly through the territory of Montana, and empties into the Missouri River, in the north-west part of Dakota Territory, lat. 48° 5' n., long. 104° w. It is 800 yards wide at its mouth, 1000 miles long, and navigable 700 or 800 miles.

The region of the Y. and its source was for the first time explored by parties from the United States in 1870 and 1871, and seems to be one of the most wonderful spots on the earth. Making their way up the river through the grand scenery of the Rocky Mountains, the explorers came to a district of a square mile in area, filled with hot springs in active operation, which cover the hillsides with snowy white deposit like a frozen cascade. Three or four miles around were occupied by springs which have ceased to flow. They are about 6000 feet above the sea, and are already resorted to by invalids. This was but the beginning of the wonders. Next they came to a terrific rift, 2000 feet in depth, with a river rolling in its depths, "a grand, gloomy, terrible place." At the head of this cañon, are the Tower Falls, with a sheer descent of 400 feet. The Grand Cañon, however, throws this into the shade. This fearful abyss is 3000 feet in perpendicular height, and to one looking up from the bottom, stars are visible in broad daylight. The ravine is full of hot springs of sulphur, sulphate of copper, alum, steam jets in endless variety, some of most peculiar form. The grandeur of the cañon is at once heightened and diversified by the Upper and Lower Falls; the latter one unbroken symmetrical expanse, 850 feet in height. Between this fall and the lake lies a region full of boiling springs and craters, with two hills 300 feet high, formed wholly of the sinter thrown from the springs, one of which is 70 feet long by 40 broad. Still further on they came to a valley containing about 1500 geysers, some throwing up immense columns of water to the height of more than 200 feet—a stupendous spectacle! The lake from which the river issues is about 300 square miles in area, is situated 7437 feet above the level of the sea, and is described as "the gem to which all the other wonders form the setting."

YEMEN, in a wide sense, includes the whole south and south-west of Arabia; but, more strictly, is the name only of the south-western corner of the peninsula, bounded on the n. by Hedjaz and Nedjed; on the e., by Hadramaut and the Duhna, or Great Arabian Desert; on the s., by the Gulf of Aden; and on the w. by the Red Sea. It was known to the ancients as *Arabia Felix* (*Felix* being a mistranslation on the part of Ptolemy of *Yemen*, which does not mean "happy," but the land to the "right" of Mecca), and they obtained from it much frankincense, myrrh, and other costly balsamic substances, in which it abounds more than any other part of the world; they obtained also from its ports the products of India, and other eastern regions, with which its inhabitants maintained a constant trade. The history of Y. reaches back to the highest antiquity. The Joktanides, descendants of Joktan or Kahtan, are its first possessors of whom we have any record; and

Yenikale
Yetnolm

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from them it seems to have passed, about 2400 B. C., into the hands of the Himyarites, or Homerites. The Himyarite states and cities of Saba, Thaphar, and Athana or Aden, attained at an early period a high degree of prosperity, carrying on a great commerce both by sea and land, and they extended their dominion over a large part of Asia and the north-west of Africa. See **SABÆANS** and **ADEN**. The persecution of the Christians by the last Himyarite princes led to the overthrow of the Himyarite power by the Abyssinians, 525 A. D. From this date till 601, Y. was ruled by *byssiniau* governors; then for a short time by the Persians, under Khosru (*Chosroes*) II. The followers of Mohammed did not succeed in subduing Y. till they had for a considerable time been masters of the rest of Arabia. Under all the califs, and even under Saladin, Himyarite princes retained a partial independence, which they reacquired when the Turks, who conquered the country in the 16th c., were expelled in the century following. For more than two centuries afterwards, the country remained under the dominion of a number of Himyarite princes or sheiks, the most powerful of them being for a time the Imâm of Saûda (q. v.). In 1871—1873 it was reconquered by Turkey.

The people of Y. differ considerably in physical characteristics, dress, and manners from the inhabitants of the other parts of Arabia, and their language gives evidence of a different origin. See **SABÆANS**.

Our geographical knowledge of Y. has been much increased by recent explorations, and charts of its coasts have been laid down by officers in the service of the East India Company. Throughout the whole length of the country, at a distance of from 10 to 80 miles from the coast, a chain of mountains extends, between which and the sea is a tract of low ground, the *Tehama*, generally sandy and desolate, but in some places very fertile, and clothed with tropical vegetation. Inland from the mountain chain is a fertile table-land, at a general elevation of about 4000 feet, yielding the productions of warm temperate rather than of tropical regions. Some of the mountains rise to the height of about 8000 feet. The slopes even of the more lofty mountains are covered with luxuriant forests, and the mountain valleys are of unsurpassed fertility. The principal exports are coffee, dates, senna, gums and gum-resins, wax, ivory, and goat-skin morocco. Some grain is also exported. There are no rivers; but good harbors are formed in some places by natural openings in the coral reefs which line the coast. The principal ports are Mocha (q. v.), famous for the coffee which it exports; Abou Arish, or Gasim; Hodeida; Shehr; and Aden (q. v.), which is now in the hands of the British. Saûda, the capital, or nominal capital, is situated on the table-land. Damar, Taas, Lolula, Belt-el-Fakih, and Zebed are among the other principal towns.

YENIKALÉ STRAIT, sometimes also called Strait of Kertch, connects the Sea of Azov with the Black Sea, forming a sea-passage between the Crimea on the west and the Caucasus on the east. It is over 90 miles in length, and at its narrowest is less than 2 miles, and so shallow and interrupted by shoals, that cautious sailing and steering are necessary even for small steamers.

YENISEI', one of the largest rivers of Siberia, formed by the junction of the Oulou-Keme and the Bey-Keme, which rise in the mountains on the southern border of Siberia. It flows north through the centre of Siberia into the Arctic Ocean, forming at its mouth a long estuary. In the earlier part of its course, it is interrupted by falls and rapids; but afterwards flows through a great plain or steppe, receiving many tributaries, of which the principal are the Upper Tunguska or Angara, from Lake Baikal; the Lower Tunguska, from the Baikal Mountains; and the Turoukchan. Its length is 3400 miles, and it drains a basin of upwards of 1,000,000 sq. miles. A great part of the Y. is navigable, and is now regularly traversed by steamers.

YENISEI'SK, a town in the government of the same name in Siberia, 850 miles east of Tobolsk, lat. 59° 27' N., long. 92° 16' E., on the Yenisei. Pop. (1867) 6644. Y. was founded in 1618, and is one of the most important towns of Siberia, the chief article of trade being furs, which are bartered by the native nomad tribes. It is three miles in circumference, and has a custom-house and arsenal.

YEO'MAN (Ang.-Sax. *gemen*, common), a term which seems, in early English history, to have been applied to a common menial servant, but after the 15th c. came

to denote a class of small freeholders, forming the next grade below gentlemen. The term yeoman is sometimes considered identical with the forty shillings freeholder, possessed of the elective franchise.

YEO'MANRY, a volunteer force of cavalry in Great Britain, numbering in 1878-14,830 of all ranks, and costing the country annually about £90,000. It was formed during the wars of the French Revolution, and then comprised infantry as well as cavalry; but the whole of the infantry corps, and many of the cavalry, were disbanded after the peace of 1814. The organisation of the corps is by counties, under the lords-lieutenant. The men provide their own horses and uniform; in consideration of which they receive annually a clothing and contingent allowance of £3 a man, are exempt from taxation in respect to the horses employed on yeomanry duty, and draw during the annual training 2s. a day for forage, besides a subsistence allowance of 7s. a day. If called out for permanent duty, they receive cavalry pay, with forage allowance. The yeomanry are available in aid of the civil power; and in time of invasion, or apprehended invasion, the sovereign may embody them for service in any part of Great Britain, under the provisions of the Militia Act and Articles of War.

YEOMEN OF THE GUARD, a veteran company, consisting of 100 old soldiers of stately presence, employed on grand occasions, in conjunction with the gentlemen-at-arms, as the body-guard of the sovereign. These Yeomen were constituted a corps, in 1486, by King Henry VII., and they still wear the costume of that period. Armed with partisans, and in the quality uniform, the men present a curious sight in the 19th century. The officers of the corps are a captain (ordinarily a peer), a lieutenant, and an ensign. There is also a "Clerk of the Cheque and Adjutant." All these appointments are held by old officers, and are considered as important prizes. The whole charge is borne by the sovereign's civil list. The head-quarters of the corps is at the Tower of London, where the men are popularly known as *Beef-eaters* (q. v.).

YEO'VIL, a small municipal borough of Somersetshire, 20 miles south of Wells, on the borders of Dorsetshire, a busy, handsome place, built of red brick and yellow Hambill (a neighboring quarry) stone, and situated in a pleasing district on a hill-side sloping to the Yeo. The church of St. John, a structure of the 15th c., is much admired. The height of the side aisles, and large size of the windows, give it grace and lightness, and hence it has been called the "Lantern of the West." There are several other churches, besides schools, almshouses, and other charities. Kid and other gloves are here more extensively manufactured than in any other town in England. There are about 20 manufactories, in which are produced about 10,000 dozen pairs of gloves per week. The number of males alone employed in this manufacture is about 2000; the females, who sew the gloves, all work at home, and are mostly the wives and daughters of agricultural laborers, inhabitants of the surrounding country, and amounting probably to about 10,000. Woollen manufactures and leather-dressing are also carried on. It has received its charter of incorporation since 1851. Pop. (1871) 8527.

YE'RCUM, another East Indian name of the plants called Madar (q. v.), and of the fibre which they yield.

YESSO, or **JESSO**, the most northerly of the four principal islands which compose the empire of Japan, lies north of the central island of Nipon, from which it is separated by the Sangar or Tsugar Strait. It is about 350 miles in length from east to west, and is 250 miles in extreme breadth. Area estimated at 62,500 sq. m.; pop. unknown. The surface is mountainous, and the island is rich in minerals and timber. Bears and deer abound in all parts of Yesso. The largest town, Maismal, on the south coast, is said to contain 50,000 inhabitants. To the n. e. of it lies the treaty port of Hakodadi (q. v.).

YETHOLM, a parish of Scotland, in the north-east of Roxburghshire, bordering on England, on the east and north-east, 15 miles east-north-east of Jedburgh. The Braumont Water runs through the parish, and on either side of this stream are the villages of Kirk-Yetholm and Town-Yetholm, the former being the head-quarters of the gipsies in Scotland. According to the census of Scotland for 1871, the village of Yetholm contained 796 inhabitants.

Yew
Yoga

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YEW (*Taxus*), a genus of trees of the natural order *Taxaceæ*, which is very generally regarded as a sub-order of *Conifera*, and is characterised by solitary and terminal fertile flowers, with a solitary ovule sessile in the centre of a fleshy disc, forming a sort of drupe when in fruit, and by dicotyledonous seeds. The genus *Taxus* is distinguished by a solitary terminal seed, surrounded by a succulent cup. The species are diffused over the whole northern parts of the world, and are large and beautiful evergreen trees, with narrow lanceolate or linear leaves. The **COMMON YEW** (*T. baccata*), a tree of 30—40 feet, and a trunk sometimes of great thickness, branching a few feet above the ground, and forming a large and dense head, is a native of the middle and south of Europe and of Siberia. Noble specimens of it are to be seen in many parts of Britain. It attains a great age, at least 300 or 400 years. Its wood has been much used from very early times for making bows, for which it is preferred to every other kind of wood. It is very hard, and reckoned almost equal to boxwood for fine work. The heart-wood is of an orange-red or deep-brown color. The fruit is red, and was long reputed poisonous, but the pulpy part is not so; the seed, however, is a dangerous poison. The leaves also are a powerful narcotic; and although they are sometimes given as a vermifuge, their use is attended with danger.—The **IRISH YEW** (*T. fastigiata* of Lindley; *T. Hibernica* of Hooker), originally discovered in Ireland, and now very common in pleasure-grounds, is by many supposed to be a mere variety of the common species, with upright fastigate habit, but it differs also in having the leaves scattered, whilst those of the Common Yew are in two rows.—The **NORTH AMERICAN YEW** (*T. Canadensis*) is of humbler growth.—The name **JAPAN YEW** is sometimes given to *Podocarpus macrophyllus*, a tree of a genus nearly allied to *Taxus*, and recently separated from it. It is a large and stout tree, a native of Japan; its wood much valued for cabinet-work. Other species of *Podocarpus* are natives of the warmer parts of Asia, of Chili, New Holland, &c. *P. nucifer* is a lofty tree of the northern provinces of Japan and mountains of Nepal, from the seed of which an oil is extracted, fit for culinary purposes, although the seed itself is too astringent to be eaten. To the order or sub-order *Taxaceæ* belongs also the genus *Salisburia* (see *Ginkgo*), the genus *Dacrydium* (q. v.), and *Phyllocladus*, a genus in which the foliage, as in *Salisburia*, has a remarkable resemblance to the fronds of ferns. *P. trichomanoides* is a large New Zealand tree.

YEZD, a considerable city of Western Persia, situated on the south west of the great desert of Khorasan, in lat. 32° 10' n., long. 54° 50' e. It is the great emporium of the internal commerce of the empire. Manufactures of silk stuffs, velvets, cotton and woollen fabrics, arms, and loaf-sugar are carried on, and the bazaars are spacious and well supplied. Pop. 40,000. This includes about 4000 Guebres (q. v.). The latter are exempt from military service, and are now said to be well treated, both by the authorities and inhabitants. They complain, however, of grievances, of which complaint was made to the Shah when in London, by their kindred and co-religionists, the Parsees of Bombay, in June 1873. See Report by Mr Ronald Thomson, Persian Secretary of Legation, on the Population, &c., of Persia, 1868, and *Times* of June 28 and July 16, 1873.

YGGDRASIL, the name given in Scandinavian Mythology to a tree, the greatest and most sacred of all trees, which was conceived as binding together heaven, earth, and hell. It is an ash, whose branches spread over all the world, and reach above the heavens. It sends out three roots in three different directions: one to the *Ass-gods* in heaven, another to the *Frost-giants*, the third to the under world. Under each root springs a wonderful fountain, endowed with marvellous virtues. From the tree itself drops a honey-dew. Among its branches and roots, several animals sit or run about: an eagle, a squirrel, four stags, a serpent, all having their own proper names. The serpent, *Nithhoggr*, lies at the under-world fountain and gnaws the root of Y: the squirrel, *Ratatöskr* runs up and down, and tries to breed strife between the serpent and the eagle, which sits aloft.

Of this old-world myth too imperfect an account has survived to enable us to read its meaning. Some writers in the middle ages bring it into connection with the Cross. It is striking to find Virgil ("Georg." li. 291) describing the ash as sending its branches as high into the air as it sends its roots into the earth—

"*Æsculus in primis, quæ quantum vortice ad auras
Ætherias, tantum radice in tartara tendit.*"

Remarkable coincidences, although of a fragmentary kind are also found in eastern traditions.

Jacob Grimm sees an intimate connection between the world-tree Y. and the *Irmenseule*, of which numerous traces are to be found in the records of German antiquity. This is described by Rudolf of Fuld as a great trunk of a tree set upright, and worshipped in the open air; the name *Irmenseule*, he explains as meaning the universal or all-sustaining pillar (Ger. *Säule*, pillar). Such a tree-idol was destroyed by Charles the Great in his conquest of the Saxons in 772, at a place called Heresburg, in Westphalia, which was the chief seat of the pagan religion of the Saxons. The word *irmia*, Ang.-Sax. *cormen*, was frequently compounded with other words in the earlier stages of the Teutonic languages. In the sense of universal, greatest of all. As the primitive nature-worship tended more and more to the personification of particular powers, these trunk-idols were associated with particular divinities, and perhaps had an image set upon them, or were cut into some rude resemblance, as in the case of the Greek pillar-images called *hermæ* (see *HERMÆ*). The coincidence of the names *irmia* and *hermæ*, which may, however, be casual, has not failed to be remarked. The Christmas tree of modern Germany may be some kind of offshoot of the old notion of Yggdrasil.

Y-MOTH (*Plutia gamma*), a beautiful species of Moth (q. v.), common in Britain and throughout great part of Europe, about an inch in entire length, without reckoning the antennæ, which are not quite half an inch. The color is lilac, variegated with brown, the upper wings beautifully marbled, with a shining mark in the form of the letter Y, or of the Greek γ (Gamma), whence the names. The lower wings are dirty white, with a broad smoky border, and a white fringe, spotted with black. This moth flies about during the day in summer and autumn. It is very swift of flight. It lays its eggs on the under side of leaves. The caterpillar is slightly hairy, green with a yellow line along each side, and five white ones down the back. It feeds on the leaves of a great variety of plants, as peas, beans, turnips, cabbages, hemp, clover, oats, and other grasses. It sometimes ravages gardens, but more in France than in Britain.

YOGA (from the Sanscrit *yuj*, join; kindred to the Lat. *jung*, Gr. *zeug*, Gothic, *fluk*; hence *function*, and figuratively, "concentration, religious or abstract contemplation") is the name of one of the two divisions of the Sāṅkhya philosophy of the Hindus. See *SĀṆKHYA*. While the first of these divisions, the Sāṅkhya proper, is chiefly concerned in teaching the *tattvas*, or principles of creation, and the successive development of the latter, the main object of the Yoga is to establish the doctrine of a Supreme Being, and to teach the means by which the human soul may become permanently united with it; and since the Sāṅkhya proper is silent on the creation of the world by a Supreme Being—whence it was charged, though unjustly, by its opponents, with being atheistical—the Yoga, which is called theistical, is considered to be its complement. According to *Patanjali*, the reputed author of this system, the term *Yoga* means "the hindering of the modifications of thinking;" and by such modifications, which, he says, may be accompanied with afflictions, or be free from them, he understands "the three kinds of evidence—viz. perception, inference, and testimony—misconception or incorrect ascertainment, fancy, sleep, and recollection." The "hindering of these modifications" is, according to him, effected either by a repeated effort to keep the mind in its unmodified state, or by dispassion, which is the consciousness of having overcome all desires for objects that are seen (on earth) or are heard of (in Scripture). Dispassion is conducive to meditation; this, again, is of different kinds, and is attained either "impetuously"—in adopting various transcendental methods—or "by a devoted reliance on *Isvara*, the Lord." This Lord, or Supreme Being, *Patanjali* then defines as "a particular *Purusha*, or spirit, who is untouched by afflictions, works, the result of works, or desires; in whom the germ of omniscience reaches its extreme limit; who is the preceptor of even the first, because he is not limited by time; and whose appellation is Om, the term of glory." This word is to be muttered, and its sense is to be reflected upon, for "from it

comes the knowledge of Is'wara and the prevention of 'the obstacles' which impede Yoga. These obstacles, Patanjali says, are "illness, apathy, doubt, listlessness about the accomplishment of meditation, want of exertion, attachment to worldly objects, erroneous perception, failure to attain any stage of meditation, or inability to continue in the state of meditation when it has been reached." There are several other methods to prevent these obstacles from distracting the mind, and impeding its steadiness. One, for instance, consists in pondering over one single accepted truth; another in "practising benevolence, tenderness, complacency, and disregard towards all objects in possession of happiness or grief, virtue or vice;" another, "in dwelling on knowledge that presents itself in dream or sleep;" &c. When all these modifications have disappeared, the mind becomes free from "the tugging" of the exterior world, as the pure crystal is free from the color that seems to belong to it, when a colored substance is seen athwart it. After having described the various modes in which the mind may appear changed into the likeness of what it ponders, the author of this system then proceeds to explain the practical Yoga, by which "concentration" may be attained. It comprises, according to him, mortification, the muttering of certain hymns, and a devoted reliance on the Lord. Through it, meditation is established, and afflictions are got rid of. By afflictions, again, he understands ignorance, egotism, affection, aversion, and tenacity of life, which terms are then the subject of an especial investigation into the nature of what is to be got rid of, of what is not desired to be got rid of, of what is constituted by the cause, and of what is the constitutive cause.—There are eight means or stages subservient to the attainment of concentration—viz., forbearance (*yama*), religious observance (*niyama*), postures (*āsana*), regulation of the breath (*prāṇāyāma*), restraint of the senses (*pratyāhāra*), steadying of the mind (*dhāraṇā*), contemplation (*dhyāna*), and profound meditation (*samādhi*).—The first stage, *forbearance (yama)*, consists in not doing injury to living beings, veracity, avoidance of theft, chastity and non-acceptance of gifts; they are the universal great duty.—The second stage, *religious observance (niyama)*, comprises purity—external as well as internal—contentment, austerity, muttering of the Vedic hymns, and devoted reliance on the Lord.—The third stage of Yoga, *postures (āsana)*, is defined by Patanjali, as "that which is steady and comfortable" at the same time. The commentators mention several varieties of such postures. According to an interesting treatise on the Yoga philosophy by Navinachandrapāla, one of these, called *Siddhāsana*, is practised by placing the left heel under the anus, and the right heel in front of the genitals, by fixing the sight upon the space between the eyebrows, and, while in this motionless attitude, meditating upon the mysterious syllable *Om* (q. v.). Of the posture called *Padmāsana* the same treatise says, that it consists in placing the left foot upon the right thigh, and the right foot upon the left thigh, in holding with the right hand the right great toe, and with the left hand the left great toe, the hands coming from behind the back and crossing each other; while the chin rests on the interclavicular space, and the sight is fixed on the tip of the nose. When the command of such postures is attained, Patanjali says, the Yogin does not suffer either from cold or heat, hunger or thirst, or similar afflictions.—The fourth stage, *regulation of the breath (prāṇāyāma)* is threefold, according as it concerns exhalation or inhalation, or becomes tantamount to suspension of the breath, the latter also being termed *kumbhaka* (from *kumbha*, a jar), because "the vital spirits then are as motionless as water is in a jar." Through such a regulation of the breath, the obscuration of the pure quality of the mind is removed, and the latter becomes fit for acts of attention. Navinachandrapāla describes different processes of the Prāṇāyāma as selected from different authorities. One, for instance, consists, according to him, in the act of inhaling through the left nostril for 7-6783 seconds, suspending the breath for 30-7152 seconds, and exhaling through the right nostril for 15-3576 seconds; then inhaling through the right nostril for 30-7152 seconds, exhaling through the right nostril for 7-6783 seconds, suspending the breath for 30-7152 seconds, and exhaling through the left nostril for 15-3576 seconds; lastly, inhaling through the left nostril for 7-6783 seconds, suspending the breath for 30-7152 seconds, and exhaling through the right nostril for 15-3576 seconds. To the *kumbhaka*, of which there are eight varieties, the same author observes, two processes are indispensable: sitting in one of the postures described; and, by means of an incision in the frænum lingue, and milking, as it were, the tongue, causing it

gradually to become so lengthened as to allow the rima glottidis to be shut by pressing back the epiglottis with the point of the retroverted tongue. Such *kumbhākas*, it is supposed, produce the most wonderful effects: some of them cure diseases of the head and lungs, dropsy, &c.; others make proof against all sorts of inflammation and fever; the eighth or last variety of the *kumbhāka*, especially, cures all diseases, purges from all sins, promotes longevity, enlightens the mind, and awakens the soul.—The fifth stage of Yoga, the *restraint of the senses* (*pratyāhara*), means the withholding of the senses from their respective objects, and the accommodating them entirely to the nature of the mind. According to an authority quoted by Navinachandrapāla, a Yogin's senses are suspended when he can suspend the respiratory movements for ten minutes and forty-eight seconds.—This stage is preparatory to the sixth, or the *steadying of the mind* (*dhāraṇā*), which means the freeing of the mind from any sensual disturbance, by fixing the thoughts on some part of the body, for instance, on the navel or the tip of the nose. This stage, it is supposed, can be accomplished when the Yogin is able to suspend his respiratory movements for 31 minutes and 36 seconds; and, according to Navinachandrapāla, it is effected by different processes—muttering the syllable *Om* 144,000 times, fixing the eyes upon the tip of the nose, or the space between the eyebrows, for two hours, swallowing the tongue for two hours, &c.—*Contemplation* (*dhyāna*), the seventh stage of Yoga, is the fixing of the mind on the one object of knowledge, the Supreme Spirit, so as to exclude all other thoughts. It is practised in consequence of the “steadying of the mind,” as defined before; and according to the authority quoted by Navinachandrapāla, a man can accomplish it when he is able to suspend his respiratory movements for 48 minutes and 12 seconds.—The eighth and last stage of Yoga, *profound meditation* (*samādhi*), is the perfect absorption of thought into the one object of meditation, the Supreme Spirit; it is devoid, as it were, of any definite character, which would suggest a term as applicable to it. In such a state, Navinachandrapāla says, “a Yogin is insensible to heat and cold, to pleasure and pain: he is insensible to blows and wounds, to the effects of fire; he is the same in prosperity and adversity; he enjoys an ecstatic condition. He is free from lust, fear, and anger; he is disengaged from all works. He is not affected by honor and dishonor. He looks upon gold, iron, and stones with the same unconcerned eyes. He is the same in love as in hatred; he is the same amongst friends and enemies.” And according to the authority he quotes, such a state may be attained by a man who can suspend his respiratory movements for 1 hour, 26 minutes, and 24 seconds.—The last three stages are also comprised under one distinctive name, *Sam'yama*, or “restraining,” because it is chiefly on the perfection attained in these three collectively that depend the wonderful results which are promised to a Yogin when he applies them to the contemplation of special objects. Such results are, for instance, a knowledge of the past and future, a knowledge of the sounds of all animals, of all that happened in one's former births, of the thoughts of others, of the time of one's own death, a knowledge of all that exists in the different worlds, of stars and planets, of the structure of one's own body, &c. There are especially, however, eight great powers which a Yogin will acquire when properly regulating and applying the *sam'yama*—viz., the power of shrinking into the form of the minutest atom; that of assuming a gigantic body; that of becoming extremely light; that of becoming extremely heavy; that of unlimited reach of the organs (as touching the moon with the tip of a finger); that of irresistible will; that of obtaining perfect dominion over the inner organs of the body; and that of acquiring mastery over everything. If the Yogin applies *sam'yama* to the contemplation of the smallest divisions of time, and the successive order in which such divisions occur, he obtains a discrimination which enables him to understand the subtle elements, and to see all objects at once. When his intellect has become free from all considerations of self, and his spirit is no longer subject to the results of acts performed, and when both have thus attained the same degree of purity, the Yogin obtains eternal liberation.—In the last chapter of his work, Patanjali then shows that these perfections are not always obtained by Yogis in one birth, but that *Prakṛiti*, or nature (see *SĀṆHYA*), generally in a succession of births brings to maturity the result obtained in a prior birth. He thus makes nature, not actions, the cause of each effect; meritorious actions merely serving, according to him, to remove the obstructions which, from bad actions, would arise to its regular progress,

just as water would take its natural course after the husbandman, who would want to lead it from field to field, had removed the obstructions that lay in its path. After having then taught that the result of actions, in successive births, consists in the recollection of a prior state, and in the attainment of a special (existence, a special duration of life, and special enjoyments); and after having discussed the different influences to which the mind may become subject in its union to different objects, Patanjali winds up with describing the mode in which final liberation gradually takes place. First, he says, when a person has obtained the discrimination conveyed by the Yoga doctrine, all ideas of self—such as, I am different from another—cease. In consequence, thought is turned inward, and this is the commencement of liberation. But, as still recollections, derived from former existences, sometimes prevail in his mind, they must be abandoned by him in the same way as he has to overcome the afflictions, above specified. When he has succeeded in this, his knowledge will have become so infinite, that but little will remain for him to be known. Then the cosmical *gunas*, or qualities, too (see *SÂṆKHYA*), having accomplished the main object of spirit, will have gradually arrived at the end of their functions, and, as a consequence, matter will become separated from spirit. This is *kaivalya*, or true liberation, for the mere power of the mind to retain its nature after dissolution has taken place, is not yet true liberation.—The practical part of the Yoga was admitted into the later Vedānta (q. v.). Its ethical portion is especially dwelt upon in the celebrated episode of the *Mahābhārata* (q. v.), the *Bhagavadgītā*. But the great power it has at all periods exercised on the Hindu mind, is less derived from its philosophical speculations or its moral injunctions, than from the wonderful effects which the Yoga practices are supposed to produce, and from the countenance they give to the favorite tendency of orthodox Hinduism, the performance of austerities. It is needless, however, to say that frequently these practices were and are merely a cloak for imposture and hypocrisy, and that the professional Yogis (q. v.), numbers of whom are met with throughout India, are often nothing but lazy mendicants or jugglers, who, by impressing the vulgar with a belief in their supernatural powers, convert it into a source of an easy livelihood. Such followers of the Yoga pretend, for instance, to foretell future events; they deal in palmistry, and profess to cure diseases. There are instances, too, where, for a handsome consideration, they allow themselves to be buried for a certain time, so as to exhibit the power of the Yoga. Two such cases are related as authentic in the treatise of Navinachandrapāla; and it would appear from them, that a human being, after having undergone certain preparations, such as the Yoga prescribes them, may be shut up in a box without either food or drink, for the space of a month, or even forty days and nights, and yet remain alive. The author of the treatise endeavors, indeed, to shew that the rules laid down by the Yoga regarding the mode of respiration, the postures, and the diet of a Yogin, may have been founded on a careful observation of the nature and habits of hibernating animals; and in support of this view, he enters into a detailed investigation of the effect of the Yoga practices on animal life. If, as it seems, his statements are correct, much of what otherwise would be incredible in the accounts given of the performances of Yogins, could be received as true, because admitting of explanation. The system of Patanjali was taught by him in a little work called “Yogasāstra,” which consist of four Pādas, or chapters, each comprising a number of Sūtras (q. v.). The oldest commentary on it is ascribed to a Vyāsa (q. v.); and this was commented on by Vachaspathi-Misra. Of other commentaries, those by Vijnānabhikṣu, Bhojadeva, and Nāgojibhatṭa are the most approved of.—For a fuller enumeration of works on the Yoga, see “A Contribution towards an Index to the Bibliography of the Indian Philosophical Systems,” by Fitzedward Hall (Calcutta, 1859). The first two chapters of the Sūtras have been translated, with annotations, founded on the commentary of Bhojadeva, by the late J. R. Brillantyne (Allahabad, 1853); and a paraphrase, but somewhat too free, of the same commentary is contained in the 4th vol. of William Ward’s “View of the History, Literature, and Religion of the Hindus, &c.,” 4 vols. (London, 1817—1820). For a brief account of the system, see also the 1st vol. of H. T. Colebrooke’s “Miscellaneous Essays,” 2 vols. (London, 1831); and for the practice of the Yoga, “A Treatise on the Yoga Philosophy”—that referred to above—by N. C. Paul (L. C., Navinachandrapāla), (Benares, 1851).

YOGIN, a follower of the Yoga system of Hindu philosophy (see **YOGA**), but in popular acceptation a term generally denoting a Hindu ascetic or devotee, a man who has entered the fourth stage of religious life as described in the *S'āstras*. A large class of such persons forms a division of the votaries of *S'iva*. See *S'ĀIVAS*.

YOKOHAMA (Japanese for "Cross Shore"), a town of Japan, in the island of Nipon, and the port for the foreign trade of Yedo. It is situated on the south side of a bight of the bay of Yedo, about 17 miles from Yedo, and opposite to Kanagawa. In 1854, it was only a small fishing village, but after it supplanted Kanagawa as the treaty port of Yedo in 1859, it rapidly increased. The Japanese government built at a great outlay solid granite piers and landing-places, a large custom-house, official residences, and shops for Japanese traders; besides houses and godowns for the foreign community and merchants. It now extends along the sea-shore for about a mile and a half, and is two or three streets deep. The pop. exceeds 60,000. The custom-house is nearly in the centre of the town; and east and west of it lie respectively the foreign and native quarters. The shops are filled with goods to suit the foreign taste—such as lacquered ware of rare quality and bronze-work, baskets and porcelain, fancy silks and embroidery, curiosities and articles of *vertu*. Since the recent changes in the policy of the Japanese government, great improvements have taken place in the native quarter. Broad and cleanly streets are rapidly superseding the former dirty and narrow thoroughfares. A canal is drawn as a cordon around the settlement on the land side, and in 1871 the Japanese government widened and deepened it very considerably. Other important undertakings have recently been carried out, the chief of which is a railway from Y. to Yedo. Gas was introduced in 1873.

In 1874, the total value of the imports (principally cotton, yarns, shirtings, woollen goods, and sugar) amounted to 16,016,816 dollars; and of the exports (principally silk and tea) to 12,578,578 dollars.

YONGE, Charlotte Mary, a novelist of considerable merit and popularity, was born in the year 1823. She is a daughter of the late William Crawley Yonge, Esq., of Otterbourne, Hampshire, sometime an officer in the 52d Regiment. The work by which she is best known is "The Heir of Redclyffe," which had great success, and has gone through several editions. Besides this she is author of "Heart's Ease," "Dynevor Terrace," "The Daisy Chain," "The Lances of Lynwood," "The Little Duke," &c. These works exhibit much literary accomplishment, and have secured for Miss Y. a public of her own. The spirit which pervades them is pure, amiable, and pious; and commonly the stories are more or less contrived as vehicles of the High-Church opinions to which the writer is warmly attached. Considerable sums accruing from the sale of her writings she is said to have devoted to the aid of religious missions in New Zealand. In addition to the fictions by which she is chiefly known, Miss Y. has published a work "On Christian Names, their History and Derivation," in which much curious erudition is displayed; "Life of Bishop Pauson" (1873); some small historical works, &c.

YONKERS, a city of New York, U. S., on the e. bank of the Hudson River, 16 miles n. of New York City Hall. In 1873 the town of Y. was divided, the northern part being constituted the city of Y.; the southern portion became part of New York City in 1874. Pop. (1880) 18,892.

YONNE, a department in the north-east of France, bounded on the n. by the department of Seine-et-Marne, on the e. by Aube and Côte d'Or, on the s. by Nièvre, and on the w. by Loiret. Area, 2860 sq. m.; pop. (1876) 359,070. The department is watered by the river Yonne, which flows across it in a north-easterly direction. The surface is hilly, many of the hills being covered with fruitful vineyards, the intervening valleys being beautiful and fertile. The vineyards yields annually upwards of 22,000,000 gallons of wine. There are some fine forests in the department. The climate is generally healthy, except in the south-west, where the marshes often give rise to fever. The soil produces abundance of grain, but the cultivation of the vine is of the greatest importance, the best wines produced here being those of Chablis, Joigny, Auxerre and Tonnerre. The chief mineral products are red granite, marble, lithographic stones, pavement, red and yellow ochre, iron. There are manufactures of cottons, woollens, beet-root sugar, bricks, tiles,

&c. The chief exports are timber, corn, and wine. It is divided into five arrondissements—viz., Auxerre, Avallou, Joigny, Sens, Tonnerre. The railway from Paris to Lyon passes through the department. The capital is Auxerre; the other chief towns are Avallou, Joigny, Sens, and Tonnerre.

YORK, Henry Benedict Mary, Duke of, Cardinal, and Bishop of Frascati, the last male descendant of the royal House of Stuart, was the second son of James (III. of England), commonly known as the Pretender. He was born at Rome, March 26, 1725; and after the failure of the attempt of his elder brother, Charles Edward, in 1745, resolved to enter the church. He was admitted to tonsure and minor orders by Benedict XIV., and created Cardinal in 1747. Clement XIII. consecrated him Bishop of Corinth in *partibus infidelium*, and afterwards of the suburban see of Frascati, where he took up his residence. He also enjoyed, through the favor of the crown of France, the revenues of two abbeys which he held in *commendam*, as well as a pension from the Spanish court; and the liberal charity with which he dispensed his income among the poor, and for the other charitable and religious necessities of his diocese, endeared him to his flock. These resources were lost at the Revolution; but, nevertheless, in the distresses of the holy see which ensued, Cardinal Y. sold his family jewels for the purpose of relieving Pius VI. in his necessities. On the occupation of Rome, he withdrew to Venice; but he returned in 1801 on the restoration of the papal authority under Pius VII. George III., having become aware of the failure of his former means of income, granted him a pension of £4000 a year, which he accepted, and enjoyed till his death. Those to whom a printed record of the "List of the Stuarts" may be interesting, will find a small collection of his "Pastoral Letters" in a 4to volume published in Rome, and entitled "Appendix ad Tractatum Synodum a Celsitudine Regia Eminentiissimi Henrici Episcopi Tusculani" (Rome, 1764). He was appointed by Pius VII. Dean of the Sacred College, and held several other dignities, and was much respected, as well by the Italians as by foreigners visiting Rome. He died at Frascati, July 17, 1817, at the advanced age of ninety-two. His last will, which is a very interesting document, is printed by Artaud in his "Vie de Pie VII." His monument, by Canova, in St Peter's, was erected by order of the Prince Regent, afterwards George IV.

YORK, House of. See **PLANTAGENET**.

YORK, the capital of Yorkshire, is situated at the junction of the rivers Ouse and Foss, the three Ridings of the county meeting at the same place, and is nearly equidistant from London and Edinburgh. It is the seat of an archbishopric, a county in itself, and a municipal and parliamentary borough. The government is vested in 12 aldermen and 36 councillors, of whom one, as in the case of London, is Lord Mayor. It returns two members to parliament. The pop. in 1871 was 45,798, being an increase from 1861 of 8868 persons, and 904 inhabited houses. In the registration district of which Y. is the centre, there are 83 parishes, with an area of 82,545 statute acres, and a pop. in 1871 of 64,909.

Y. is amongst the most ancient of British cities. Before the Roman invasion, it was one of the chief towns of the Brigantes, the most numerous and powerful of the British tribes. It was constituted a Roman station, under the name of *Eboracum*, by Agricola about 79 A.D., and was very soon the principal seat of Roman power in the north, perhaps in Britain. While the Roman dominion existed in the island, Y. was a city of the first importance. Here Hadrian lived and Severus died. Here, too, died Constantine Chlorus, the father of Constantine the Great, and here, as many believe, his greater son was born. When the emperors visited the province, Y. was their chosen residence, and it was the abode of the imperial legates when the emperors were absent. Little is known of the city for a century after the departure of the Romans, about 409 A.D., but it certainly suffered much during the long conflict between the Britons and the Picts, against whose incursions Y. was a material defence. It afterwards became the capital of Northumbria. The first metropolitan church in England was built here by Edwin, the Northumbrian king whom Paulinus baptised; and here also Edgar, the first sole monarch of England, held, in the year 966, the Witenagemot. William the Conqueror was long unable to overcome this stronghold of the north, notwithstanding his coronation by its archbishop, Aelfric. One Norman garrison, numbering 3000 men, was put to the sword in 1069;

but William exacted a terrible vengeance in the following year, when he laid waste the whole country between Y. and Durham.

The first English parliament was held at Y. in 1160 by Henry II., and for 500 years afterwards parliaments continued to be summoned occasionally to the ancient city. Under Henry III., the courts of King's Bench and Exchequer sat at Y. for seven years; and for a few months, Richard II. removed thither the courts of King's Bench and Chancery. During the insurrections consequent upon the dissolution of the monasteries by Henry VIII., Y. was seized by the insurgents of the "Pilgrimage of Grace"; and in its immediate neighborhood, Fairfax, in 1644, conquered Prince Rupert on Marston Moor. Typical of a very different time and order of things is the fact that the British Association for the Advancement of Science was first organized at Y. in 1831.

A city so ancient necessarily presents many interesting memorials of antiquity. There are remains or memorials of Roman towers and temples, and of the earliest British churches. One of the most magnificent of the Anglo-Saxon churches was erected at Y. in the 8th c., and this, destroyed by fire, rebuilt, enlarged, and changed from time to time, is now known as York Minster. A portion of the original church was disinterred during the excavations which followed the latest burning of the minster, in 1529. The present structure takes rank with the finest specimens of Gothic architecture in the world. It was mainly built in the 13th and 14th centuries. Its length from base to base of the buttresses, is 524 feet, and its extreme breadth 250 feet, being 24 feet longer than St Paul's Cathedral, and 149 feet longer than Westminster Abbey. The magnificent east window is 75 feet high and 52 feet broad, and contains about 200 compartments, each a yard square, representing scriptural subjects. War and fire have conspired to deform or destroy this splendid cathedral. Twice it has been burned down, once in 1069, and again in 1137, each time to rise more beautiful than before. During the times of the Commonwealth, much damage was done by war and wantonness, and several of its older monuments were mutilated or broken up. In 1829, it was set on fire by Jonathan Martin, a fanatic; and the roof of the choir, 223 feet long, with all the woodwork on each side, was destroyed. While this disaster was being repaired, a workman's candle was carelessly left burning, one night in 1840, and again a terrible fire broke out, destroying the south-western tower, with its splendid peal of bells, and the roof of the nave. The cost of the repairs exceeded £100,000.

A monastery of Benedictine monks was built, or rather completed, at Y. in the time of William Rufus, which was in great part reconstructed about the end of the 13th century. Its abbot had a mitre and a seat in parliament. Some portions of the original building yet remain. Thirteen seceders from this monastery established, in 1181, the neighboring Abbey of Fountains, near Ripon, under Cistercian rule. On the site of the Benedictine monastery now stand the museum and gardens of the Yorkshire Philosophical Society. The same order had a priory dedicated to the Holy Trinity in Micklegate, and a nunnery outside the walls at Clementhorp. Besides these, the Dominicans, Franciscans, Augustinians, and Carmelites had each a monastery, and the Gilbertines a priory, within the city. In the immediate neighborhood were 16 hospitals. At the Reformation, Y. contained 41 parish churches, 17 chapels, 16 hospitals, and 10 religious houses. Twenty-two of the churches yet remain, and several new churches and chapels of ease have been built in or near the city. The Roman Catholics have two chapels, and the various bodies of dissenters, 14.

The educational institutions of Y. are numerous and useful. Notable among them are St Peter's School, founded in 1557; Archbishop Hoigate's Free School, dating from Henry VII.; the Blue Coat School for boys, and the Gray Coat for girls, supported chiefly by annual subscriptions; the York Collegiate School (proprietary); the York and Ripon Diocesan Training-school for Masters; and the Yorkshire School for the Blind, dedicated to the memory of William Wilberforce, and conducted in a palace originally built for the Lord President of the Council of the North.

The Yorkshire Philosophical Society was formed in 1822, and possesses a handsome building and gardens on the site of the ruined St Mary's Abbey, with a museum, rich in antiquarian relics and specimens illustrative of natural history. Among other public institutions are the County Hospital, the first established in England

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north of the Trent; the Lunatic Asylum; the Dispensary; the Friends' Retreat; and very many charitable foundations for the benefit of poor persons. The ancient castle, with the exception of its imposing Clifford's Tower, is superseded by the modern and commodious assize courts. The Guildhall, a fine Gothic building, was erected in 1446. There are also convenient assembly and concert rooms, and a creditable theatre.

Whatever the trade of York may have been in ancient times—and old writers speak of it in glowing terms—it counts for little now. The making of leather-gloves, combs, glass, &c., supplies employment to many; some find employment in iron-foundries, in flax-spinning, and the manufacture of linen; and of late, the construction of railway carriages has become part of the city industry.—See Drake's "Eboracum;" Browne's "History of the Metropolitan Church of St Peter's, York;" Britton's "Cathedral Antiquities—York;" Hargrave's "History of York;" Gent's "York;" Wellbeloved's "Eboracum, or York under the Romans."

YORK, a shire-town of Pennsylvania, on Codorus Creek, 10 miles south-west of the Susquehanna River, 38 miles south-south-east of Harrisburg, at the intersection of several railways. It has a spacious granite court-house, numerous churches, handsome residences, six banks, seven newspapers. Pop. in 1880, 13,940.

YORK, a river of Virginia, formed by the union of the Pamunkey and Mattaponi, flowing south-east to the Chesapeake Bay, nearly opposite Cape Charles. It is 40 miles long, and from one to three miles wide. Yorktown, an ancient but decayed port, on the right bank, eleven miles from its mouth, was the scene of Lord Cornwallis's surrender, October 19, 1781.

YORKSHIRE, which is larger in territorial extent than any other two counties in England, is situated nearly in the centre of Great Britain, about midway between London and Edinburgh. "Its extreme points," says Allen, in his History of the county, "lie between the parallels of 53° 18'—54° 40' N. lat., and between 0° 40' of W.—0° 10' of E. long. from Greenwich. On the N. side it is separated, in its whole extent, from the county palatine of Durham by the river Tees; from the mouth of the same river to the entrance of the Humber, the whole E. side is bounded by the German Ocean; on the S. side it is divided from Lincolnshire by the rivers Humber and Trent. The boundaries between Y. and the counties of Nottingham, Derby, Cheshire, Lancashire, and Westmoreland are merely conventional, being indicated by no natural feature of the country." The longest diagonal of the county, north-west to south-east extends about 130 miles; the shortest, south-west to north-east, about 90. It contains about 6095 square miles, or 3,882,831 statute acres. It is divided into three Ridings, North, East, and West, and a small district not included in any of the three, the Ainsty of York. The Ridings (a corruption of tri-thing or thirding) date back to Saxon times, and are peculiar to Yorkshire. Each has a separate military and civil jurisdiction, and each its own lord-lieutenant and public buildings. The North Riding contains 11 wapentakes: the East, 6; the West, 9. In the whole county, besides the archiepiscopal city, there are 59 market-towns, and 1639 parishes, townships, and places. The North Riding (including for Parliamentary purposes the Ainsty and City of York) returns 2 county and 12 city and borough members; the East Riding, 2 county and 3 borough members; the West Riding, 6 county members (3 for the Eastern Division, 3 for the Northern, and 2 for the Southern) and 16 borough members. According to the census of 1871, the population was 2,436,353. Three-fourths of the whole number were resident in the West Riding. Since the first census in 1801, the population had increased by 1,577,222 persons, or 184 per cent.

The history of the county in early times may be mainly read in that of its chief city. Apart from the events which transpired at, and in connection with York, there is little to be recorded. It was originally occupied by the Brigantes, and was subjected by the Romans under Agricola about 71 A.D. When the Roman occupation ceased, it was long and greatly troubled, first by Pictish, and then by Saxon incursions. Under Saxon rule the traces of Brigantian occupancy were soon obliterated, only the rivers, mountains, and a few remarkable natural curiosities retaining their British names, while all things else received Saxon designations. The county formed part of the kingdom of Northumbria, taking the name of Deira (the Country of Deer), when that

kingdom was divided. In the troublous times which preceded the Conquest, many battles were fought against invading Danes, and generally with success. At Stamford Brig, a few miles from York, Harold, the last of the Anglo-Saxon kings, defeated the united Danish and Norwegian armies, three weeks before he fell before the Normans on the fatal field of Hastings. Among the more notable events of later history, may be named the battle of Wakefield, where the Duke of York was defeated by Queen Margaret in 1460; the battle of Towton Field, near Tadcaster, fought on Palm Sunday in 1461, the most sanguinary conflict of the bitter war between the rival Roses; and that of Marston Moor, which gave the final blow to the falling fortunes of Charles I. Since that time, with slight exceptions, the history of Y. has been one of peace and prosperity.

The surface of the county is greatly diversified. On its north-western border runs a range of lofty hills, many of them containing extensive caverns, and giving birth to wild and romantic streams. Here is Ingleborough, 2361 feet above the sea-level, with its marvellous cave, half a mile long, full of beautiful stalactites; Wharfedale, 2384 feet high, with its subterranean cataract of 75 feet in Weathercote Cavern; and the vast mass of Mickie Fell, 2600 feet, which overlooks the waters of the Tees and Lune. Eastward, far away, rise the Hambleton and Cleveland Hills. Lower down are the Wolds, a line of chalk hills stretching from Flamborough Head to Ferryby on the Humber. The hills and dales of Craven, which cover a large tract of county in the west, abound in natural beauty. Right down the centre of the county, from the Tees to the Humber, runs the great Vale of York. Across its northern border flows the Tees. Coming southward, we find the dales of the Swale, the Ure, the Nidd, the Wharfe, the Aire, the Calder, and the Don, all on the western side of the county, each sending a river to the central vale, where the united waters, with the Derwent and a few smaller tributaries from the east, form the Ouse; while the Ouse, after uniting with the Trent, becomes the Humber estuary, which rolls eight-tenths of the Y. waters to the sea. The Ribbles, rising in Craven, passes by Preston, and falls into the Irish Channel, and is the only Y. river which finds a western outlet. The Eek joins the German Ocean at Whitby, and the Tees between Redcar and Hartlepool.

Geologically, Y. is too large a subject for us to do more than touch. The Vale of Y., rarely more than 100 feet above the sea, has on its western side the long slow elevations which culminate in the Pennine chain, while on the east rise the lower but more sudden eminences of the Wolds and the high grounds of Hambleton and Cleveland. On the west are the millstone grit and mountain limestone, the two coming together in lofty opposing eminences in many parts of Craven, where, along the line of what is called by geologists the "Craven Fault," the limestone rises into magnificent cliffs many hundreds of feet in height, and nearly 2000 above the level of the sea. The limestone is in many places very rich in lead-ore. On the east lie the Chalk Wolds, and the Oolitic and Lias formations, with the Kluameridge Clay of the Vale of Pickering, and the accumulations of sand, gravel, and other sediments which make up Holderness. In the south-western district is a splendid coal-field, intermixed with iron-ore, extending over 600 sq. miles. Valuable deposits of iron ore have also been discovered recently in Cleveland, in the north-eastern part of the county.

In the north-west, the lower parts of the North Riding, Craven, and the East Riding, the land mainly supplies occupation to the inhabitants. Craven is almost purely a grazing district, and so are most of the upper lands and dales in the county. Excellent corn is grown in the vales of York and Cleveland, and the East Riding has many large and excellent farms. The horses of Y., both for the race-course and for use, are too well known to need eulogy. The manufactures of the county are immense. Leeds is the centre of the woollen, as Bradford is of the worsted trade. Sheffield is the principal seat of the cutlery manufacture; while the Cleveland district is rapidly rising into importance for mineral wealth and enterprise. The large iron-works of Low Moor, Bowling, and Rotherham, and the flax and linen manufactures of Leeds and Barnsley, merit a passing notice, with the blankets and cloths of the Huddersfield district, and the new llama and alpaca industry introduced at Saltaire near Bugley, by Mr Titus Salt. Harrogate, Ilkley, Askern, and Croft are the principal inland health-resorts of the county; Scarborough, Filey, Bridlington, and Whitby take the lead on the coast.

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The public works of Y. rank with the finest in the kingdom. Among them are the Aire and Calder Navigation, 15 miles long; the Calder and Hebble Navigation; the navigation of the Don and Sheffield region, 40 miles; and the Huddersfield Canal, one of the most surprising engineering works in England. This canal is 20 miles in length, and rises between Huddersfield and Marsden by 42 locks to the height of 656 feet. At this elevation, the highest canal-level in the country, it passes by a tunnel more than three miles long under Strandedge, a range of hills between Marsden and Saddleworth. The canal terminates near Dukinfield. Add to these the Leeds and Liverpool Canal—which cost 46 years of labor, and is 129 miles long—besides many smaller, but very costly undertakings, and some idea may be formed of the activity of Y. in this direction. Its railway communications are excellent, and grow in number and completeness every year. On these lines, in consequence of the mountainous districts through which many of them pass, are to be found some of the longest and most difficult tunnels, viaducts, bridges, embankments, and cuttings which have yet been attempted by engineers in England.

A very brief reference to the antiquities and natural curiosities of the country must suffice. Traces of great Roman roads are found in many places, as well as of Roman, Saxon, and Danish encampments. In the Wolds are many tumuli; and it is supposed by some that the singular and imposing mass of rocks called Brimham Crags, which overlook Nidderdale, about four miles from Pateley Bridge, was once a Druidical temple. The ruins of ancient abbeys and priories are numerous and beautiful. Few can rival the glories of Fountains and Rievaulx, and the scenery which encompasses Bolton Priory is delightful. Besides these, there are the ruins of Kirkstall, Roche, and Selby in the West Riding; St Mary's at York; Jervaux, Byland, and Whitby in the North Riding; and many others. Of castles, we may name in the West Riding, Conisborough Castle, near Doncaster, one of the oldest and most interesting ruins known to antiquaries; Knarborough, Pontefract, and Skipton, the last still used as a residence; in the North Riding, Richmond, with its unrivalled Norman keep; Middleham Castle, where the king-maker, Warwick, lived, and where Edward IV. was immured; and Bolton Castle, the prison for a time of Mary Queen of Scots; in the East Riding, Wressle Castle, once the home of the Percies. Of old York Castle, nothing now remains but its massive Clifford's Tower.

... The lover of the picturesque will find the Y. scenery full of charms. The rapid of Caldron Snout, on the Tees, 200 feet in descent; High Force, on the same river, a perpendicular fall of 60 feet over a cliff of greenstone marble; Ayegarth Force and Hardraw Force, on the Ure; the Strid, immortalised by Wordsworth, in Bolton Woods on Wharfe; the magnificent Gordale Scar and Malham Cove, each nearly 300 feet in height, on the upper waters of the Aire; and the uncounted glens and streams among its myriad hills, are sufficient to indicate the attractions of its river and mountain aspects. It would require a volume to do them justice.—See Allen's "History of the County of York;" Whittaker's "Histories of Richmondshire, Craven, and Leeds;" Hunter's "Hallamshire;" Gent's "York, Ripon, &c.;" Phillips's "Geology of Yorkshire," and "Rivers, Mountains, and Sea-coasts of Yorkshire."

YO'RUBA, or Yarriba, a country of Guinea, West Africa, lying to the east and north-east of Dahomey, in n. lat. 6°—9°, and e. long. 2°—6°. Its area is about 70,000 sq. m.; and the pop. is estimated at 2,500,000. Palm-oll, cotton, and ivory are the principal articles of export. Lagos (q. v.) is the port through which trade with foreign countries is chiefly carried on. There are numerous large towns in Y., but the people are little, if at all, less barbarous in their customs than their neighbors of Dahomey.

YO-SE'MITE, Yo-Hamité, or Ahwahné, a valley and waterfall of California, in the east of the state, about 57 miles from Conterville, on a large feeder of the San Joaquin, and on the western side of the Sierra Nevada. The scenery of California is remarkable for its combination of loveliness with sublimity; and in no part of the country yet explored are these characters so strikingly displayed as in the Y. valley—a valley of from 8 to 10 miles long, and a little more than a mile wide; in some places filled with noble oaks, in others opening out into broad grassy fields; with a river rushing through it about 40 yards in breadth; pine covered mountains towering

with very steep slopes to the height of 3600 feet; a precipice or "bluff" in one place rising perpendicularly 3059 feet above the valley; in another, a rock almost perpendicular, 3270 feet high; waterfalls pouring over its sides from heights of 700 to almost 1000 feet; and one great waterfall, broken into three leaps, but of which the whole height is 2550 feet. Of the other waterfalls on the sides of the valley, the Pohono, or Bridal Veil Waterfall is particularly to be remarked for its beauty, as well as for its height, which is 940 feet, and almost unbroken. The Y. valley, first entered by white men in 1853, has begun to attract visitors since California has become peopled, and has already its hotels and guides, like the valleys of Switzerland and the Falls of Niagara.

YOU'GHAL, a seaport, parliamentary, and municipal borough of the barony of Innakilly, county of Cork, Munster, Ireland, situated in lat. 51° 57' n., long. 7° 52' w., on the estuary of the Blackwater, 157 miles south-west from Dublin. The pop., which, in 1851, was 7410, and in 1861, 6328, was, in 1871, 6081, of whom 5346 were Roman Catholics, 584 Protestant Episcopalians, and the rest of other denominations. The town has some structures of interest—the parish church, which is formed of the nave and aisles of the ancient collegiate church, built by the Earl of Desmond in 1464; the "clock-gate;" and Sir Walter Raleigh's house, which remains nearly in its original state. There is a handsome Roman Catholic church, as also churches of the several other denominations; two convents; several schools; a fever hospital, a lying-in hospital, and several other benevolent institutions. The trade of Y. is considerable, but lies chiefly in the export of agricultural produce. The harbor, which is obstructed by a bar, does not admit vessels of more than 400 or 500 tons burden; the fisheries are extensive and valuable, and employ a considerable number of hands. There are several remains of buildings, civil, ecclesiastical, and military; and according to the local tradition, the potato was first planted at Y. by Sir Walter Raleigh. Y. returns one member to the imperial parliament. The constituency in 1878 was 264. Its municipal affairs are managed by commissioners, 21 in number. The rateable value of property is £3540.

YOUNG, Arthur, an eminent writer on agriculture, was born September 7, 1741, and educated at Lavenham in Suffolk. In 1758, he was apprenticed by his father, a doctor of divinity and clergyman of the Church of England, to a mercantile house in Lynn. But Y. had no liking for business, and devoted much of his attention to literature. On his father's death, in 1759, he undertook the management of a small farm, of which his mother had a lease. Six years afterwards he became a farmer on his own account in Essex. He seems, at the same time, to have acted as a parliamentary reporter; and as he only saw his farm from Saturday till Monday, it need not be wondered that he found it unprofitable. At the end of five years, he gave £100 to a practical farmer to take the lease off his hands. In the meantime, however, he had made notes of the results of numerous experiments on his farm, which he afterwards published, under the title of "A Course of Experimental Agriculture." His first successful book was, "A Tour through the Southern Counties of England," which was followed by other works describing the state of agriculture in various parts of England, and in Ireland. The enthusiasm of Y., and his lively style, made his writings popular, and by them the knowledge of many judicious practices, confined to one locality, was spread throughout the whole empire. In 1784, Y. began the publication of the "Annals of Agriculture," of which 45 vols. 8vo were published. Three years later, he was invited by Count du la Rochefoucauld to make a tour in the south of France. What he saw, induced him to undertake a series of tours in France, through a great part of which he travelled leisurely on horseback. The result was his most important work, "The Agricultural Survey of France." The author did not confine his attention to agriculture, but described the social and political condition of the people in a lively and truthful manner, and his work has become, in consequence, the most reliable source of information regarding the state of France just before the Revolution. In 1801, the French Directory shewed the value attached to the writings of Y., by ordering the whole of his agricultural works to be translated into French. They were published at Paris, in 20 vols. 8vo, under the title of "Le Cultivateur Anglois." In 1808, Y. received a gold medal from the English Board of Agriculture, "for long and faithful services in agriculture." He died April 12, 1820.

YOUNG, Brigham, American Mormon leader, was born at Whittingham, Vermont, June 1, 1801, and was the son of a small farmer proprietor. In 1832, having become converted to Mormonism, he was made an elder of the Church of the Latter-day Saints, and began to preach at the Mormon settlement at Kirtland, Ohio. In 1835, he was appointed one of the twelve apostles of the Church, and sent as a missionary to the New England States, where he was very successful in making converts. After the Mormons had been driven from Kirtland to Missouri, and from the latter to Illinois, and the murder of Joseph Smith by a mob (1844), Y. was chosen President in his place. The year following, the charter of Nauvoo was repealed by the legislature of Illinois; and after a cannonade of three days, the Mormons were driven from their capital and temple, and led by President Y. to Utah, where they arrived, after a toilsome journey, July 24, 1847. Next year, the great body of Mormons arrived and founded Salt Lake City; and in 1850, President Fillmore appointed Brigham Y. governor of the territory for four years. In 1854, in consequence of the Mormons setting the Federal laws at defiance, by having in 1852 proclaimed polygamy as the "celestial law of marriage," Colonel Suptoe was appointed governor in Y.'s place; but on visiting Utah, he thought it an unsafe residence, and resigned. The Mormon President exercised supreme authority, and said: "I am and will be governor, and no power can hinder it until the Lord Almighty says: 'Brigham, you need not be governor any longer.'" In 1857, a new governor, Cumming, was appointed, and sent with a force of 2500 United States troops to protect him and the Federal officers; but Y. forbade them to enter the territory, and cut off the supply-trains. A compromise was, however, effected, the Mormons pardoned, and the troops remained until 1860. The determination of the United States to abolish polygamy, and the appointment, in 1869, of a new U. S. governor, contributed somewhat to reduce Y.'s authority. In 1874 his fifteenth wife petitioned the U. S. courts for a divorce, and separated from him. Y. died August 29, 1877, leaving a fortune of two million dollars to 17 wives and 56 children. See **MORMONS, SALT LAKE CITY, and UTAH.**

YOUNG, Edward, the author of the well-known "Night Thoughts," was born in the year 1684, at Upham, in Hampshire, of which parish his father was at that time rector. He was educated at Winchester School, and afterwards, in 1702, went to Oxford. In 1708, a law fellowship in All Souls College was conferred on him by Archbishop Tenison. With law, however, he seems pretty much to have declined to meddle, occupying himself, by preference, with poetry and religious studies. In 1714, he obtained his degree of B.C.L.; and that of D.C.L. followed in 1719. Meantime, he had come before the world as a poet, by publishing, in 1712, an "Epistle to George, Lord Lausdowne," on his being created a peer. For Y., who continued through life one of the most persevering and audacious toadies that ever flattered a patron, this was a characteristic beginning. In the same year, he also published two other poems of some length, entitled respectively "The Last Day," and "The Force of Religion, or Vanquished Love;" the year following, he again flowed forth in "A Poem on the Death of Queen Anne." These performances procured him some amount of immediate reputation. In 1719, he ventured on the more ambitious effort of a tragedy, which, under the title of "Busiris," was brought out at Drury Lane. The piece had a fair success, through which means it probably was that he attracted the notice of the strange and eccentric Duke of Wharton, with whom, in the end of that year, he was induced to go for a short time abroad. The duke seems to have entertained for him a real kindness, and to have treated him with much liberality. At the duke's death, Y. set forth certain claims against his estates, which he succeeded in making good to the extent of an annuity of £200. The details of the case are perplexed, and need not here be entered into. They involve nothing dishonorable to Y., yet convey a somewhat unpleasant impression that the pious author of the "Night Thoughts," in his extreme solicitude about the next world, contrived to keep a pretty sharp eye to his little pocket-interests in the present one. In 1721, was produced his tragedy, "The Revenge," which, though unsuccessful at the time, has since had greater acceptance, and is the only one of his pieces still occasionally acted. His third and last attempt in this field, "The Brothers," was produced in 1723. Between 1725 and 1728, appeared in succession his satires, under the title of "The Love of Fame, the Universal Passion." These had a great success, and brought to their fortunate

author money as well as fame. They abound with wit and vivacious observation, and even now will very well repay perusal. Of "The Instalment," a poem, issued in 1726, and addressed to Sir Robert Walpole on his being made a Knight of the Garter, it seems enough to say, that inasmuch as we incidentally hear from Swift of a pension granted him, we may surmise that this was the service to the public by which he had contrived to earn it. In 1727, Y., having taken holy orders for the purpose, was appointed one of the royal chaplains; and in 1730, he became rector of Welwyn, in Hertfordshire. The year after, he married Lady Elizabeth Lee, daughter of the Earl of Lichfield, and widow of Colonel Lee. He is supposed to have been very happy with her, as he exhibited great grief on her death in 1741. It is believed that from his solemn meditations on the event, he got the suggestion of the "Night Thoughts," begun shortly after, and published 1742—1746. By this work almost solely it is that he has continued to be remembered. His mind retained its activity to the last. He published various other works, now so entirely forgotten, that it would be waste of time to enumerate them; and in 1762, superintended a collected edition of his works, in 4 vols. 12mo, from which he had the grace to exclude certain of the most fulsome of his dedications, probably as having served their turn, and not likely to be of further use. His death took place on April 12, 1766. Since that time, his "Night Thoughts" has passed through editions innumerable, and is more or less familiar to every reader. It displays much gloomy force of pious reflection; and has passages of fine imagination, frequently somewhat marred by an epigrammatic mannerism of expression. Certain of its sententious lines have passed into common use, and become in a manner proverbial. Though now somewhat declined from the estimation in which he was long held, Y. must continue, on the strength of it, to hold a distinct and even high place in that interval in our literature which divides the artificial and so-called classical school of Pope from the return to a simpler and more natural manner, heralded some time afterward by Cowper. If we except his one great weakness of character—an inordinate appetite for preferment and worldly honours, which sought its gratification in ways somewhat servile and unworthy—there seems every reason to believe that Y. was, on the whole, a very excellent and worthy man, and sincerely devout Christian.

YOUNG, Thomas, M.D., one of the most ingenious and original philosophers of this century, and almost as eminent for his scholarship and his linguistic discoveries, as for his contributions to science, was born at Milverton, in Somersetshire, on the 18th of June 1773. His parents, Thomas and Sarah Young, were Quakers of the strictest sect; and Y. had the impression that the peculiar doctrines of the Quakers had a favorable influence upon his character and career. In particular, he connected with the Quaker doctrine of divine suggestion the perseverance with which he followed up any pursuit in which he engaged, to which he, like Buffon, was disposed to attribute all the discoveries which his genius enabled him to make. Wonderful stories of his youthful precocity have been recorded, and they seem to have more truth in them than such stories usually have. In 1780, he was sent to a boarding-school at Stapleton, near Bristol, where he remained two years; he was afterwards put to a school at Compton, in Dorsetshire, kept by a Mr. Thompson, who appears to have been an able and judicious teacher. When he left Compton, in his 14th year, besides having a great knowledge, for his age, of Greek and Latin and of Mathematics, he had learned French and Italian, and, without any tuition, had made considerable progress in Hebrew, Persian, and Arabic. In 1787, he went to live with Mr. David Barclay of Youngsbury, near Ware, in Hertfordshire, an eminent member of the Society of Friends, partly as the fellow-pupil, partly as the tutor of that gentleman's grandson, Hudson Gurney. A Mr. Hodgkin was called in to assist the studies of the two lads, but Y. soon proved to be superior in acquirements to his instructor, and virtually the three became fellow-students. Mr. Hodgkin published in 1793 a work entitled "Calligraphia Græca," which he dedicated to Young. Y. continued to live with Mr. Barclay till 1793, spending the summer months in Hertfordshire, and the winter in London, studying Greek and Latin, the modern languages, the Oriental as well as the European, the higher mathematics and natural philosophy, and, by way of amusement, botany and zoology. He taught himself to write Latin with fluency and elegance, and to write Greek verses, which received the commendation of some of the best judges of the time. During the winters of 1790 and 1791, he

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attended lectures on chemistry in London. It may be remarked, that neither then nor at any subsequent time did he shew much disposition towards experimenting; his bias seems to have been towards the pure rather than the observational sciences.

Towards the end of 1792, under the advice of Dr Brookesby, an eminent London physician, his mother's uncle, who had been greatly impressed by his abilities and attainments, he began to study medicine; and he attended medical lectures for two years in the schools of London, and afterwards for a year at the university of Edinburgh. After going to Edinburgh, Y. gave up the Quaker dress and the more inconvenient of Quaker customs; he took lessons in music and dancing, mixed freely in society, and occasionally went to the theatre. These changes, though not intended to go further, eventually led to his complete estrangement from the Society of Friends. From Edinburgh he went to the German university of Göttingen, from which, after nine months' residence, he got the degree of Doctor of Medicine. He continued upwards of a year longer in Germany, and visited various medical schools, returning to England in February 1797. At that time, the membership of the College of Physicians was restricted to graduates of Oxford and Cambridge; and to qualify himself for it, Y., on his return, entered as a fellow-commoner at Emmanuel College, Cambridge, at which he remained until he took his degree in 1799. In the year 1800, having become a member of the College of Physicians, he took up his residence in London, and began to practice as a physician. He took the degree of M.B. at Cambridge in 1803, and that of M.D. in 1807. His uncle, Brocklesby, who died in 1797, had left him £10,000, besides his house in London, with his furniture, library, and collection of pictures, so that he was in possession of a moderate competency.

In 1801, he was appointed Professor of Natural Philosophy in the Royal Institution, then newly established, and he began to deliver lectures early in the following year. As a lecturer, he was not popular, his style being too condensed, and the matter of his lectures unsuited to the miscellaneous audiences of the Royal Institution. He published in 1803 a "Syllabus of a Course of Lectures on Natural and Experimental Philosophy," in which, among other things, he first announced his great discovery of the law of the Interference of Light (see INTERFERENCE), which by itself, as Sir John Herschel has remarked, would have procured him a scientific immortality. It was this discovery which first fairly turned the balance of evidence in favor of the undulatory as against the molecular theory of light (see UNDULATORY THEORY OF LIGHT). It is Y.'s most important contribution to science. He had been elected a Fellow of the Royal Society as soon as he was 31; in 1803, he became its foreign secretary, a post which he retained till the end of his life. He resigned his professorship on his marriage, in 1804, fearing that his filling a chair of science might interfere with his success as a physician. The lectures which he delivered as professor were the foundation of the "Course of Lectures on Natural and Mechanical Philosophy" which he published in 1807—a great work, embodying a complete system of natural and mechanical philosophy, on which he was engaged for nearly five years. A new edition of these Lectures was published in 1845, edited by Professor Kelland of Edinburgh. Y.'s doctrine of Interference was at first unfavorably received by scientific men in England: it was attacked and ridiculed in the "Edinburgh Review;" and so little interest was taken in the subject, that of a pamphlet which Y. published in answer to the "Edinburgh Review," only a single copy was sold. As has often happened, the first recognition of the importance and ingenuity of this and others of Y.'s speculations came from the scientific men of the continent.

Y. was admitted a Fellow of the College of Physicians in 1803, and was elected one of the physicians of St George's Hospital in 1810. He afterwards published several medical works, which, though they were little more than compilations, and are now forgotten, shew that he was thoroughly versed in the history of diseases and of medical opinion. His hospital practice, too, is said to have been successful; but he had but little success in getting patients. He retired from practice—retaining, however, his connection with St George's Hospital—in 1818, on his appointment to be Secretary of the Board of Longitude. On the dissolution of the Board of Longitude, he became the sole conductor of the "Nautical Almanac;" and afterwards, when the system of life insurance began to be popular, he held, along with this post, the office of scientific adviser of a life insurance company. During the last

years of his life, he was a member of a council appointed to advise the Admiralty in scientific matters.

Y.'s greatest achievement, after his great discovery of the law of Interference, was made in connection with the subject of Hieroglyphics (q. v.). He was the first to hit upon the process of investigation by means of which the received interpretation of hieroglyphics has been arrived at. His discovery, originally published in papers written for the Society of Literature, and afterwards in the "Encyclopædia Britannica," was given to the world in a book in 1823. In his later years, much of his attention was given to this and cognate subjects. He was engaged on an Egyptian Dictionary at the time of his death. His miscellaneous writings, contributions to the Transactions of learned and scientific bodies, to Reviews, and to the "Encyclopædia Britannica," were very numerous. Three volumes of them, two consisting of Scientific Papers, edited by Dean Peacock, the third of Hieroglyphical Essays and Correspondence, edited by John Leitch, were published in 1855.

He died, after several months of failing health, and a short period of severe illness, on the 10th May 1829. His character seems to have been singularly amiable, and to have endeared him to a multitude of friends, by one of whom, Dr Peacock, Dean of Ely, an ample biography of him was published in 1855. Y. was, two years before his death, elected a foreign Associate of the Academy of Sciences at Paris, succeeding to the illustrious Volta.

YPRES, or **YPEREN**, a town of Belgium, formerly fortified, in the province of West Flanders, is situated in a fertile plain, on both sides of the Yperlee, about 29 miles south-south-west of Bruges (53 by railway). The marshes around the town at one time rendered it very unhealthy, but considerable improvement has been effected in this respect by drainage. Y. was at one time one of the most important manufacturing towns in Flanders, the number of inhabitants in the 14th c. being 200,000, and the number of looms 4000. Its staple manufacture consisted of the cloth called, according to some, after the name of the town, Diaper. The only remnant of its once flourishing manufacture is the Cloth-hall (*Les Halles*), standing in the great market-place, a building of prodigious size, in the form of a trapezium, in a rich style of Gothic architecture, and surmounted by a stately square tower or belfry, with a clock and chimæ. It was begun in 1280, and continued till 1843; the east end, supported on pillars, being added in 1730. One of the wings is now used as the *Hôtel de Ville*, and other parts are occupied by different public establishments and concert-rooms. The cathedral of St Martin is a fine Gothic edifice, with an altar of Carrara marble, a richly carved pulpit, and a picture doubtfully attributed to Van Eyck. Other buildings are the churches of St Peter, St James, and St Nicholas, the old castle-ward, two colleges, several hospitals, barracks, numerous boarding and day schools, &c. The chief modern manufactures are thread, lace, lincens, woollens, cottons, silk, ribbons, leather, oil, soap, tobacco. There are many tanneries, oil-mills, salt-works, dye-works, breweries. The town is connected with the Yeer by canal, and is a station on the West Flanders Railway. Pop. (1876) 15,516.

Y. is a very old town, its origin dating from the 9th and 10th centuries. In 1688, it was strongly fortified by Louis XIV., and in the great European wars was frequently subject to sieges.

YPSILANTI, a Phanariot family, which falsely pretends to be descended from the imperial stock of the Comneni, has furnished various champions of the Christian population under Turkish rule. The first of these, PRINCE CONSTANTINE Y., was born in 1760 at Constantinople, and for his translation of the works of Vauban, was raised to high official rank by Sultan Selim III., and was subsequently appointed hospodar of Moldavia in 1799, and of Walachia in 1802. His administration of the government of these provinces was marked by wisdom and energy; but his ill-concealed sympathies with Russia led (1806) to his dismissal and flight to Transylvania. Re-established in the government of Walachia by the Russians, he shewed his hatred for the Porte by inciting (1807) the Servians to insurrection; but finding soon after that his allies, the Russians, had views and aims quite inconsistent with his, and unable to strive with both Russians and Turks, he took the oath of allegiance to the czar, and retired to Kiev, where he died 23th July 1816. He has left numerous works, composed in Italian, French, and Turkish.

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His three sons, Alexander, Demetrius, and Nicolas, followed up the same course of policy. The eldest, ALEXANDER, born in 1783, served for some time in the Russian army, and was chosen by the "Hetaïrists" as their chief in 1820. In promotion of the cause of Russian independence, he collected a large arm by subscription in Russia, and afterwards invading Moldavia, succeeded in raising an insurrection in both principalities. But, little suited by natural gifts to guide the movement he had originated, he was attacked by the Turks near Galatz, totally defeated, and forced to take refuge in Austria, where he was arrested and imprisoned. Released after a time, but broken in spirit by chagrin and privations, he retired to Vienna, where he died 31st January 1828.—His younger brother, DEMETRIUS, who was born 25th December 1793, also commenced his career in the Russian army, and joined his brother in his schemes for emancipating from servitude the Christian population of Turkey. Sent to Greece, armed with powers from his brother, he took a glorious part in the capture of Tripolitza (October 1820), but was less successful in the following year in his attack on Eubœa. His gallant defence of Argos against the Turks, stopped the victorious march of the latter, and gained (1823) for him the honorary titles of President of Argos, Prince of the Peloponnesus, President of the Legislative Council, and Senator. His stubborn resistance (1825) to the victorious Ibrahim at Napoli was another valuable service to Greece. In 1827, the grateful Hellenes made him commander-in-chief of their forces; but some difference arising between him and the President, Capo d'Istria, he resigned his post in January 1830. He died at Napoli di Romania, 16th August 1832. Y. was insignificant in appearance, but had the soul of a hero; and was as deaf to the allurements of pleasure as to the promptings of ambition.

Y'SSEL, or IJSSEL, a river of the Netherlands, formed by the junction at Doesburg, in Gueldres, of the Oude (Old) Yssel from Westphalia and the New Yssel, an offshoot of the Rhine, cut by Drusus. After this it flows north and latterly north-west past Zutphen and Deventer, forming part of the boundary between Gueldres and Overijssel, and, passing Kampen, falls into the Zuider Zee, after a course of about 80 miles, forming at its mouth a delta, which is gradually increasing. The principal affluents are the Borket, the Schipbeek, and the Grift.—There is another river of the same name, a branch of the Rhine, in the province of Utrecht.

Y'STAD, a seaport town in the extreme south of Sweden, on the Baltic, in the lœn of Malmöhus, and about 30 miles south-east of Malmö. The town is well built, and has a handsome market-place, two churches, a town-house, barracks, &c. There is a good harbor, and a brisk and improving trade is carried on, steamers plying to Stockholm, Lübeck, Kalmar, Stettin, Stralsund, and Copenhagen putting in here. It has manufactures of tobacco and snuff, chicory, soap, woollen cloths, and leather; there is also some shipbuilding. Pop. (1876) 6663.

Y'TTRIUM is a very rare metal, whose oxide is the earth *Yttria*, which is found in the Scandinavian mineral *Gadonite* (a silicate of yttria, glucina, and an oxide of cerium and iron), in *Yttrolantite*, and in one or two other very scarce minerals. Neither the metal, the oxide, nor the salts of the oxide are of any practical importance. According to Mosander, three bases have been confounded under the single name of yttria; to the most abundant of these he gives the name *yttria*, while he distinguishes the others as *erbia* and *terbia*.

YUCATAN. See MEXICO.

YUCCA, a genus of plants of the natural order *Liliaceæ*, natives of North and South America, and some of which are often cultivated in gardens on account of the singularity and splendor of their appearance. *Y. gloriosa* is a native of Virginia and of more southern parts of North America, but quite hardy in England. It has a stem about two or three feet high, the upper part of which produces a great tuft or crown of large sword-shaped evergreen leaves, each terminating in a sharp black spine. From the centre of this crown of leaves arises the flower-stalk, of three feet or upwards in height, branching out on every side so as to form a great panicle. The flowers are bell-shaped and drooping, white with a purple stripe on the outside of each segment of the perianth. The fibres of the leaves are used by the American Indians to make a sort of cloth and cordage.—The other species have a general re-

resemblance to this in habit and appearance. The fibre of the *Yuccas* is similar to that of the *Agaves* and *Bromelias*, and probably is often included under the name *Pita Fibra* or *Pita Fibre*.

YUDHISHT'HIRA. See PĀN'D'AVAS.

YUGA (from the Sanscrit *yuj*, join; kindred to the Lat. *jung*-, the Gr. *zeug*-, Gothic *juk*:- hence, literally, junction) denotes, in Hindu mythology and astronomy, a long mundane period of years, which is preceded by a period called *Sandhyā*, "twilight," and followed by a similar period called *Sandhyān's'a*, "portion of twilight." Manu, the *Mahābhārata*, and the *Purāṇ*'as name four such periods, three of which have already elapsed—viz., the *Kṛitā*-, *Tretā*-, and *Dvāpara*-Yuga; while the fourth, or *Kali*-Yuga, is that in which we live. The *Kṛitā*-Yuga, according to these works, consists of 4000 divine years, its *Sandhyā* of 400, and its *Sandhyān's'a* likewise of 400 divine years. The *Tretā*-Yuga consists of 3000, and its *Sandhyā* and *Sandhyān's'a* of 300 divine years each; the *Dvāpara*-Yuga of 2000 divine years, with 200 such years to its *Sandhyā*, and 200 to its *Sandhyān's'a*; and the *Kali*-Yuga of 1000 divine years, with 100 such years to its *Sandhyā*, and 100 to its *Sandhyān's'a*. And since a divine year comprises 360 solar years of mortals, a year of men being a day of the gods, these Yugas, with their *Sandhyās* and *Sandhyān's'as*, would severally represent 1,728,000, 1,296,000, 864,000, and 432,000, or in the aggregate, 4,320,000 solar years of mortals—a period called *Mahāyuga*, or "a great Yuga;" 4,320,000,000 years being a day and night of Brahmā. See *KALPA*. The notion on which the theory of these Yugas and their *Sandhyās* and *Sandhyān's'as* is based, as may be easily inferred from the foregoing statement, is that of a descending progression, 4, 3, 2, 1, each of these units multiplied by 1000, and in the case of the periods preceding and following the Yuga, by 100 years. The deteriorating process thus indicated in the succession of these Yugas, is also supposed to characterise the relative physical and moral worth of these mundane ages. "In the *Kṛitā*-Yuga," Manu says, "men are free from disease, attain all the objects of their desires, and live 400 years; but in the *Tretā* and the succeeding Yugas, their life is lessened gradually by one quarter."... "In the *Kṛitā*-Yuga, devotion is declared to be the highest object of men; in the *Tretā*, spiritual knowledge; in the *Dvāpara*, sacrifice; in the *Kali*, liberality alone." See also for other passages the article *KALPYUGA*. The present or *Kaliyuga* of the world commenced in the year 3101 B. C., when in the year 1867, therefore, 4968 years of the *Kaliyuga* would have expired.—The term Yuga is sometimes also applied to other divisions of time. The *Vishṇu*-*Purāṇ*'a, for instance, mentions, besides the Yugas above named, a Yuga which consists of a cycle of five years, called *Samvatsara*, *Parivatsara*, *Idvatsara*, *Anuvatsara*, and *Vatsara* (see Wilson's translation of this *Purāṇ*'a, 2d ed., by Fitzedward Hall, vol. i. p. 49, ff.; vol. ii. p. 254, ff.); and a Yuga, or cycle of five years, is, as Colebrooke states ("Miscellaneous Essays," vol. i. p. 106, ff.), likewise the cycle described in the astronomical treatises connected with the Vedas. The use of the term Yuga, however, in such a special sense is not frequent, whereas its application to the four mundane ages is that which generally prevails in the classical and medieval Sanscrit literature.—For other works, besides those already referred to, which afford information on these and other divisions of Hindu time, see "Kalā Sankalita, a Collection of Memoirs on the various Modes according to which the Nations of the Southern Parts of India divide Time," &c., by John Warren (Madras, 1825); and "Carnatic Chronology, the Hindu and Mohammedan Methods of reckoning Time explained," &c., by Charles Philip Brown (Lond. 1868).

YULE, the old name (still in provincial popular use) for Christmas. It points to heathen times, and to the annual festival held by the northern nations at the winter solstice as a part of their system of sun or nature worship. In the Edda, the sun is styled *fagraheel* (fair or shining wheel); and a remnant of his worship, under the image of a fire-wheel, survived in Europe as late as 1828. The inhabitants of the village of Kouz, on the Moselle, were in the habit, on St John's Eve, of taking a great wheel wrapped in straw to the top of a neighboring eminence, and making it roll down the hill, flaming all the way: if it reached the Moselle before being extinct, a good vintage was anticipated. A similar usage existed at Trier (see Grimm, "Deutsche Mythologie," p. 536). The old Norse *hvel*, A.-S. *hveol*, have developed into Icel. *Ástól*, Swed. and Dan. *hjul*, Eng. *wheel*; but from the same root would

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seem to have sprung old Norse *jól*, Swed. and Dan. *jul*, A.-S. *geol*, Eng. *Yule*,* applied as the name of the winter solstice, either in reference to the conception of the sun himself as a wheel, or, more probably, to his wheeling or turning back at that time in his path in the heavens. Goth *hveila*, Eng. *while*, denote time as wheeling or revolving. The general nature of the festival, and the way in which the observances were overlaid, or transformed and masked by the Christian institution, are noticed under the head of CHRISTMAS. In the greenery with which we still deck our houses and temples of worship, and in the Christmas trees laden with gifts, we perhaps see a relic of the symbols by which our heathen forefathers signified their faith in the power of the returning sun to clothe the earth again with green, and hang new fruit on the trees; and the farmety still or lately eaten on Christmas eve or morning in many parts of England (in Scotland, the preparation of oatmeal called *sowens*, is used), seems to be a lingering memory of the offerings paid to Hulda or Berchta (q. v.), the divine mother, the northern Ceres, or personification of fruitfulness, to whom they looked for new stores of grain. The burning of the *Yule-log* (or *Yule-clog*) testifies to the use of fire in the worship of the sun (see BELTAIN).

YVETOT, an old town of France, in the dep. of Seine-Inférieure, is situated on an elevated and fertile plain, 59 miles north-east from Havre, and 23 north-west from Rouen by railway. The houses are mostly of wood, roofed with slates, the principal street being upwards of two miles long; there is a well-planted promenade, but the town contains few objects of interest. There are manufactures of linen, cotton, calico, and velvet, and a considerable trade in cattle and agricultural produce. Pop. (1876) 7686. The Lord of Y. is styled "Roi d'Yvetot" in old chronicles, and antiquaries have been much puzzled to account for the origin of the title. There is a tradition that Clothaire, son of Clovis, having slain one Gauthier, Lord of Y., before the high altar of Soissons, endeavored to make atonement for the sacrilegious deed by conferring the title of king on the heirs of Gauthier.

* In one of the Frisian dialects, *jule* or *jole* is used to signify a wheel.

Z

Z. The last letter of the English and other West European alphabets, had no place in the original Latin alphabet, but was adopted in the time of Cicero from the Greek along with *γ* (*g*), and thus stood last. In Greek, it had the sixth place, and had the power of a double consonant, being equivalent to *ds* or *ed*; in Latin, its use was confined to words of Greek origin. In High-Ger., in which it is pronounced like *ts*, it corresponds to *t* in the Low-Germanic and the Scandinavian tongues, e. g., *zeit* = Eng. *time* (time). In Ital. *z* or *zz* mostly takes the place of the Lat. *ts*, as in *negotio* = *negotium*, *palazzo* = *palatium*, and is pronounced *ts*, or, preceded by *a*, *da*. In Eng. and in Fr., it represents the flat sibilant sound of which *s* is the sharp. But in Eng., as in the vast majority of cases, *s* has always been employed to represent the flat sibilant sound as well as the sharp (e. g., in almost all plurals, as *bones*, *cards*, in words like *revise*, &c.), there is a tendency to drop the use of *z*, except in a few individual words, such as *size*, *prize*. Many maintain the use of *z*, in words derived from the Greek, especially from verbs in *ize*, as *baptize*, and also in words formed on the analogy of these, as *legalize*; but even the advocates of this rule do not act on it consistently, and the mere English scholar is fairly puzzled. This is one of the points of English orthography most urgently calling for reform.

ZAANDA'M, or Saardam, a town in N. Holland, is situated on both banks of the Zaan, at its entrance into the IJ (a deep and narrow bay of the Zuider Zee), now converted into land intersected by canals, bearing rich crops. *Z.* lies 5 miles north-west of Amsterdam on the other side of the bay. In former times, shipbuilding was largely carried on, but has nearly ceased. The whale-fishing, which, in 1701, employed 35 ships, has been abandoned. There is still a considerable shipping-trade. The principal industries are sawing wood, preparing vegetable oil—chiefly from colza—manufacturing paper, grinding grain, mustard, dye-stuffs, snuff, &c., making starch, rope-spinning, and iron-founding. At a distance, the town looks like a forest of windmills. *Z.* is a pleasant place, and many of the inhabitants are reputed to be wealthy. In 1697, Peter the Great worked in one of the ship-building yards as a carpenter, and the house in which he lived is carefully preserved. It was visited in 1814 by the Emperor Alexander of Russia, and is now enclosed with another building, to prevent exposure to the weather. There are two Dutch Reformed churches, one Lutheran, two Baptist, and two Roman Catholic churches, a Jewish synagogue, and several institutions for orphans and old people. Two public schools, a school of design, and two poor schools are maintained by the town. Pop. (1873) 12,026; (1875) 12,346.

ZABERN (the Roman *taberna*, tavern) is the name of three German towns on the west side of the Upper Rhine, one of which was French till 1870. The first two are in the Palatinate (Rhenish Bavaria)—viz., Berg-Zabern, a town of about 3000 inhabitants, on the Erlenbach, occupied chiefly with agriculture and some small manufactures; and Rhein-Zabern, about four miles further east, on the same stream, with little more than 2000 inhabitants, noted for the two battles fought there and at the village of Jokgrin, about two miles further south, between the Austrians and the French, 29th June and 30th August 1793.

The other, which, to distinguish it from these, is called Alsace-Zabern (French *Saverne*), till the war of 1870 in the French dep. Bas Rhin, is now capital of a circle in the German Imperial territory Alsace-Lorraine. It is situated on the Zorn, which flows into the Rhine, on the Paris and Strasburg Railway and highway, and also on the Marne and Rhine Canal. The town contains a palace and college, and had (1875) 5774 inhabitants, employed in making cloth, pottery, leather, and hardware, and in the transport of wood from the Vosges Mountains. It belonged in the 19th c. to the bishops of Metz, and afterwards to those of Strasburg. There are still some Roman antiquities in the college. In 1696, the fortifications were razed. The stately palace was rebuilt by Cardinal Louis de Rohan, famous in the story of the Diamond Necklace (q. v.); it served in 1817 and 1818 as barracks for the Austrian army of occupation; in 1859 it became a home for the widows and daughters of the members of the Legion of Honor; and now it is again a barrack. The surrounding scenery is rich in ruins and picturesque effects. A spiral walk, called the Zabern Path, about nine miles long, leads, with many windings and 17 covered bridges, to the top of the Vosges, from which the spectator looks down on Alsace as a garden. The Pass of Zabern, or Saverne, which divides the Upper and Lower Vosges, is only 1525 feet high. The railway, the canal, the Zorn, and highway all run side by side along the charming valley; and there is a constant succession of bridges, embankments, viaducts, and tunnels throughout the 45 minutes' journey from Z. to Saarburg.

ZABISM. In the article on **SABMANS** (q. v.), we spoke chiefly of certain inhabitants of Arabia Felix, the "Sabaiot" of the Greeks, or Sabaii of the Romans. It appears that this name was, in the 4th c. A. D., superseded by that of Himyarites, and belonged to many tribes, that derived their descent from one Sabā ("a descendant of Eber, or descendant of Noah"), who also was called Abd Shemesh—Servant of the Sun. These Sabmans, who considered themselves pure autochthonous, in contradistinction to the immigrated tribes, have often been confounded with a number of other peoples of antiquity, and with professors of many forms of religious belief and speculation; in fact the confusion that has sprung out of the unwieldy mass of information found respecting these many varieties, and which has been hopelessly mixed up by many generations of orientalists and theologians, is almost without parallel. We shall not here survey the manifold systems and theories that have been evolved from time to time, and handed down carefully, but we shall rather (in the main following Dr Chwolson) enumerate the principal stages of Z. as it appears, considered as a religious phase of mankind. We must premise that we exclude at once those imaginary Zabians who were taken by the medieval Arabic, Jewish, and Persian writers to be identical with heathen or star worshippers, as well as those who, like the ancient Chaldeans, the ante-Zoroastrian Persians, the Buddhists, &c., were vaguely called by that name by Mohammedan and other writers of the 12th c. These writers all start from the notion that Idolatry, star-worship, and Sabalism were identical, and they called nearly all those who were neither Jews or Christians, nor Mohammedans or Magians, heathens or Sabians. Z. had then become, like Hellenism, from being a *nomen gentile*, an appellative. Confusing ourselves to historical Z., we have to distinguish (1) the Chaldean Zabians of the Koran. These are the "Parsified" Chaldean heathens or non-Christian Gnostics—the ancestors of the present Mandaites, or so-called Joannes Christians, who live not far from the Persian Gulf, and speak a corrupt kind of Chaldean-Aramaic; and (2) the Pseudo-Zabians, or Syrian Zabians (in Harran, Edessa, Rakkah, Bagdad), or, since 880–881 A. D., remnants of the ancient Syrian but Hellenised heathens. These disappear (as Zabians) since the 12th c., but perhaps still exist, under some other name, in Mesopotamia. It is those pseudo-Zabians who spoke the most refined Syro-Aramaean dialect. They form the chief representative of Z. emphatically deserving of the name. The first named, or Chaldean (Babylouian) Zabians, who transferred that name to the Harranic Zabians, and were of great influence upon the development of these latter's peculiar speculations, are the people meant under that designation by the Koran, and by the Mohammedans of this day. They are, as we said, also known as Christians of St John, or Mandaites. Among the Nabathean heathens of the north-east of Arabia and the extreme south of Mesopotamia, near Wailath and Basra, there arose, in the last decennium of the 1st c. A. D., a man named Elxai—(Elchaisai—Scythianus), born in the north-east of Parthia (probably an adherent of Zoroastrianism, perhaps also acquainted with Buddhism), and spread among them

Parsee ideas and Parsee religious rites and customs. They called themselves Mendaïtes—i. e., Gnostics. Many of their religious legends and tales they adopted at a later period from their Jewish and Mohammedan neighbors—chiefly, it is presumed with a view of making themselves less hated by the ruling Mohammedan powers. They received the name of Sabiliu from their constant washings, and purifications and baptisms. Their Arabic neighbors occasionally translated this word into the Arabic *Al-Mogtasilah*, "those who wash themselves." About a hundred years after the foundation of this sect by Elchasal, Manes was born of Mendaïte parents, and was brought up among the Mendaïtes. He remained faithful to this creed up to his 24th year, at which period he founded the new sect of Manichæans (q. v.), which did not at first depart so considerably from Mendaïsm as it did at a later period (see MANICHÆANS). To these aboriginal Zabians there succeeded in 830 A. D., a totally different kind of sect under the same name—viz., the Harranian Syrians. They themselves derived their denomination from one Zâbi who is variously called a son of Seth, son of Adam, or a son of Enoch or Idris, or a son of Methuselah, or of some fictitious Badl or Mari, a supposed companion of Abraham; while the Mohammedan writers, who, like the Greeks, endeavor to derive everything from their native tongue, either declare it to be derived from *asaba*, "to turn, to move," because they turned to the paths of untruth, instead of that of the true religion—i. e., Islam; or, as the Zabians themselves sometimes explain it, "because they have turned to the proper faith." Another Arabic derivation makes them take their name, still more absurdly, from a root *asabaa* = to fall away from the proper religion, or to turn one's head heavenwards—i. e., for the purpose of worshipping the angels and the stars, &c. European scholars have for the most part followed either Brooke or Scaliger, who variously hold the name to have sprung either from an Arabic root, which would point to their having come from the "east," or, again, from the Hebrew word for "Host," viz., of heaven, which they were supposed to worship. The real state of the case, however, is that, whatever the derivation of the name, it did not originally belong to the Harranians, as we have stated already, but was assumed by them, for the purpose of evading the Mohammedan persecutions, from the people mentioned in the Koran.

But it is by no means easy to say who these so-distinguished Harranians really were, and what, since it was neither Judaism, nor Christianity, nor Mohammedanism, nor Magism, their religion really consisted of. Former investigators mostly took them to have been a distinct race and people, and their religion to have been composed of Chaldæism, Parsism, Judaism, Christianity, Neo-Platonism, Gnosticism, and Cabbalistic speculations. This, however, is far from being the fact. Broadly speaking, they might perhaps best be described as Syrians, who, partly descended from Greek colonists, had been subject so long to Syrian influences that they became in a manner Syrianized. Their religion was heathenism, the old heathenism of their Syrian fathers, which had, with incredible obstinacy, resisted not only Christianity, but rendered even Mohammedan ill-will harmless by stratagem. There can, however, be no doubt about certain foreign non-pagan elements having crept into it during the early Christian centuries. Eclecticism prevailed at that period, and it was not only Greeks and Romans that found the influence of foreign, chiefly eastern, metaphysical speculation irresistible. But apart from that peculiar syncretism, we find many other new additions to Harrian idolatry in the shape of Zabism. There are, first of all, a certain number of legends about biblical personages from whom they pretend to be descendants—legends, which it may be presumed, they only, for the nonce, permitted to belong to their sacred traditions. There are further a number of laws of purity and impurity, and of sacrifices, which strongly remind of Judaism. Again, names of Greek and Roman gods, such as Helios, Aræ, and Kronos, occur, a circumstance that perhaps may be explained from the prevailing tendency of the period of exchanging the names of native divinities for Greek and Roman names. Besides these foreign elements, there are certain metaphysical views incorporated in their creed which are distinctly traceable to Aristotle, and finally, the theurgico-Neo-Platonic religious philosophy of heathenism, such as it is found in Porphyry, Proclus, Iamblichus, and the rest. All these apparently incongruous elements, however, infused into it by the circumstances of the period, do not prevent Z. from

being in reality heathenism. Were further proof needed, we should find it in the words of a celebrated Zabian, Thabit ben Korra, quoted by Barhebræus, in the shape of a panegyric on the town of Harran and its heathenism, uttered, as Barhebræus says, in his "purblind obstinacy." After speaking of Christianity—not to its advantage—for some time, Thabit rejoices over the blessings that still belong to his native place, Harran, through its having kept itself utterly unshaken by that faith. "We," he continues (the Zabians or Harranians), "are the heirs and progenitors of heathenism, which has once been gloriously spread over this globe. Blessed is he who bears his burden for heathenism's sake, with firm hopes. Who has civilised the world and built its cities, but the nobles and the kings of heathenism? Who has constructed the harbors and has made the rivers navigable? Who has taught the hidden science? To whom else has the deity revealed itself, given oracles, and told the things of the future, but to the most celebrated men among the heathen? . . . Heathens have done all these things. They have brought to light the healing of souls; they have taught their salvation; they have also made manifest the art of healing the body; they have filled the world with institutions of government and with wisdom, which is the highest good. Without heathenism, the world would be empty and poverty-stricken, and swallowed up with great misery."

Without entering into a detailed account of the many sources whence our information is derived with regard to the creed itself, we shall briefly indicate that they are written in Arabic, in Hebrew, and in Greek. The former are the most copious; those in Hebrew are chiefly represented by Maimonides; and the Greek are ascribed to various pseudonymous writers, among whom figure Aristotle and Hermes Trismegistus. From their various, and, to a great extent, contradictory statements, we owe the following indications regarding the principal points of this creed. The Creator, it teaches, is in his essence, primitivity, originality, eternity, One; but in his many manifestations in bodily figures, manifold. He is chiefly personified by the seven lending planets, and by the good, knowing, excellent, earthly bodies. But his unity is not thereby disturbed. It is, the Zabians say, "as if the seven planets were his seven limbs, and as if our seven limbs were his seven spheres, in which he manifests himself, so that he speaks with our tongue, sees with our eyes, hears with our ears, touches with our hands, comes and goes with our feet, and acts through our members." Nothing, we are told, is more foreign to Z. than—what holds good of the creed of the Sabæans only—rude star-worship. Z. according to the authority of Sharnatanî, expresses the idea that God is too great and too sublime to occupy himself directly with the affairs of this world; that he therefore has handed over the ruling of it to the gods, and that he himself only takes the most important things under his special care; that, furthermore, man is too weak to address himself directly to the Highest, that he therefore is obliged to direct prayers and sacrifices to the intermediate deities to whom the rule of this world is intrusted. Thus the veneration shewn to planets, and even the worshipping of idols, is nothing but a symbolical act, the consequence of that original idea. There are many gods and goddesses in Z. of this intermediate stamp. It is not the planets themselves, but the spirits that direct and guide them and deliver them which are taken as deities of this kind—deities that stand to the spheres in the relation of soul to body. Apart from these there are those gods who cause or represent every action in this world. Every universal natural deed or effect emanates from a universal deity, every partial one from a partial deity that presides over part of nature. Everything that appears in the air, which is formed near the sky or arises from the earth, always is the product of certain gods, that preside over these manifestations, in such a manner that the rain in general, as well as every special drop of it, has a presiding nomen. These spirits also mould and shape everything bodily from one form into the other, and gradually bring all created things to the state of their highest possible perfection, and communicate their powers to all substances, beings, and things. By the movement and guidance of these spiritual beings, the different elements and natural compositions are influenced in such a way that the tenderest plant may pierce the hardest cliff. He who guides this world is called the first spirit. These gods know our most secret thoughts, and all our future is open to them. The female deities seem to have been conceived as the feeling or passive principle. These gods or intelligences emanate directly from God without

his will, as rays do from the sun. They are, further, of abstract forms, free of all matter, and neither made of any substance nor material. They consist chiefly of a light in which there is no darkness, which the senses cannot conceive, by reason of its immense clearness, which the understanding cannot comprehend, by reason of its extreme delicacy, and which fancy and imagination cannot fathom. Their nature is free from all animal desires, and they themselves are created for love and harmony, and for friendship and unity. They are not subject to local or temporal changes, and they rule the heavenly bodies, without finding the motion of the most heavy too heavy, or that of the lightest too light. Their existence is full of the highest bliss, through their being near to the Most High, whom day and night they praise, without ever feeling fatigue or lassitude, to whom they are never disobedient, but whose will they always fulfil with supreme delight. They have a free choice, and always incline to the good. "These spiritual beings, our lords and gods, are our intermediators and advocates with the Lord of lords and God of gods." All substances and types of the bodily world emanate from the spiritual world, which is the one from which everything flows, and to which everything returns, and which is full of light, sublime and pure. These two worlds correspond to each other, and are to each other like light and shadow. The way to approach these gods, and, through them, the highest essence, is by purifying our souls from all passions, by keeping a strict guard over our words and deeds, by fasting, heartfelt prayer, invocations, sacrifices, fumigations, and incantations. By steadfastly persevering in these and similar acts of devotion, man may reach so high a step of perfection that he may communicate even directly with the Supreme Power. The planets, as the principal representative and intermediate gods, are to be carefully observed, especially as regards—1, the houses and stations of the planets; 2, their rising and setting; 3, their respective conjunctions and oppositions; 4, the knowledge of the special times and seasons, the hours and days of the ruling of special planets; 5, the division of the different figures, forms, climates, and countries, according to their dominant stars—the prevailing notion of the Zabians being, like that of the Chaldees and the sect of the so-called Mathematicians (according to Sextus Empiricus), as well as of the Neo-Platonists in general, that everything below heaven was subject, in a manner, to the influence of stars, or the spirits that inhabit and rule them. Every substance, and every action, every country and every hour, has its special planetary deity. It is therefore well to study carefully the special conjunctions and figures, as well as the special mixtures of incense, which might cause the individual nomen to be propitious. Thus, e. g., according to the Zabian belief, the first hour of Saturday stands under Saturnus, and it is therefore right and advisable to select at that time such prayers, seals, amulets, dresses, and fumigations as might be supposed to be particularly pleasing to that planetary god.

In order to address themselves to *visible* mediators, some of the Zabians are supposed to have directed their devotions to the stars themselves. But they soon found how futile a worship it was that addressed itself to things that appeared and disappeared in turn. They therefore manufactured permanent representatives of them in the shape of idols—idols wrought in as complete accordance as possible with the theological rules derived from the nature of the deity to be represented. They were of gold, to represent the sun; of silver, to indicate the moon. The very temples in which they were placed were of as many corners as were supposed to correspond to the form of certain stars.

We know but little with regard to the cosmogonical notions of the Zabians. Sharastani, one of our principal authorities, only quotes "Agathodæmon" as his authority for their assuming five primordial principles, viz.: the Creator, Reason, the Soul, Space, the Vacuum. Out of these, all things are composed. According to another source (Kathibi), however, the Zabians assumed two living and active principles—God and the Soul; further, a passive one, Matter; finally, two which are neither living nor passive—viz., Time and Space. Matter seems to have been held by them to be primeval and everlasting, and to it alone the existence of evil is attributable. God created the spheres only, and the heavenly bodies therein. It is these spheres (fathers) which carry the types or ideas to the elementary substances (mothers), and out of the combination, conjunction, and motion of these spheres and elements, the varying earthly things (children) are produced. Matter is, as we said, because of its defective nature, the

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source of evil, of ignorance, of folly; whilst the form is the source and fountain-head of the good, the right, the knowledge, and the understanding. Z. further assumes a renewal of this world after each great "world-year"—a space of 36,435 ordinary years. At the end of these periods, the plants, the animals, and the men that had existed within it, cease to propagate themselves, and a generation of each of them, different from all previous ones, springs into life. How far this theory is identical with the Babylonian, Egyptian, and Indian theories on the same subject, we cannot here investigate; suffice it to call attention to the striking likeness apparent in them all.

Man, the Zabians teach, is composed of contradictory elements, which make him the vacillating, struggling creature he is. Factions and desires rule him, and lower him to the level of brute creation, and he would utterly lose himself, were it not for such religious rites as purifications, sacrifices, and other means of grace, by which he may be enabled to approach the great gods once more, and to attempt to become like unto them. There are different kinds of souls; or rather man's soul partakes partly of the nature of the animal soul and partly of that of the angelic soul. The soul never dies, and punishments and rewards will affect only it, but not everlastingly. But rewards and punishments will not be wrought in any other future world, but in this, only at different epochs of existence. Thus, all our present joys are rewards for good deeds done by us in former epochs, and the sorrows and griefs we endure, spring in the same manner from evil actions we committed at former stages. As to the nature of the general (world-) soul itself, they say that it is primitive, for if it were not so, it would be material, as every new-created being partakes of the material nature. Yet a material soul would be an impossibility. "The soul, which is thus an immaterial thing," says Kathibi, "and exists from eternity, is the involuntary reason of the first types, as God is the first cause of the intelligences. The soul once beheld matter, and loved it. Glowing with the desire of assuming a bodily shape, it would not again separate itself from that matter of which means the world was created. Since that time, the soul forgot itself, its everlasting existence, its original abode, and knew nothing more of what it had known before. But God, who turns all things to the best, united it to matter, which it loved, and out of this union the heavens, the elements, and other composite things arose. In order that the soul might not wholly perish within matter, he endowed it with intelligence, whereby it conceived its high origin, the spiritual world, and itself. It further conceived through it that it was but a stranger in this world, that it was subject to many sufferings in it, and that even the joys of this world are but the sources of new sufferings. As soon as the soul had perceived all this, it began to yearn again for its spiritual home, as a man who is away from his birthplace pines for his homeland. It then also learned that, in order to return to its primitive state, it had to free itself from the fetters of sensuous desires, and from all materialistic tendencies. Free from them all, it would regain its heavenly sphere again, and enjoy the bliss of the spiritual world."

From all this, it will be seen, as we stated at the outset—that the Zabians, about whom so much has been theorised and fabled, were simply heathens who had to a certain extent adopted and modified Neo-Platonic ideas, such as floated in the mental atmosphere of the early Christian centuries. It would be needless to enter into a discussion about the semi-fabulous personages to whom they ascribe the foundation of their creed, such as Agathodæmon, Aram, Hermes, and the rest; or some of those mentioned by other writers, such as Zoroaster, Nawarib, Orpheus, and the rest.

The life of this sect was but short. After having first been on terms of great friendship with the ruling powers of Mohammedanism as well as with Christians and Jews, and having filled many of the highest and most responsible posts at the courts of the kalifs, they were by degrees made the butt of fanaticism and rapacity. Multed, persecuted, banished at different periods, they disappeared from history since the middle of the 11th century. Some obscure remnants of them seem to have survived in remote corners of Mesopotamia, but they, too, no longer adhere to the original creed, but are mixed up with the Mendaites, mentioned above, and the Shemsijeh, or sun-worshippers. Thus obscurely ended a sect which, for 200 years, had produced a host of men pre-eminent in every branch of learning and literature, in philosophy, astronomy, history, natural history, poetry, medicine, and the rest.

Many of these men whose name and fame reached Europe, were confounded with their Mohammedan contemporaries, chiefly because they lived in Bagdad, at that time the centre of learning, the seat of the kalifs and high dignitaries of state. The Mohammedans, however, had so high an appreciation of Zabian learning, that it became proverbial amongst them, and they could explain it only by tracing it to a supernatural source, notably to Hermes (Trismegistus), the father of the Zâbi, mentioned above.

We have in our sketch mainly followed Chwolson, who, aided by profound learning and acumen, has been the first to clear up the nature of Z., this terrible stumbling-block of many generations of investigators.—For detailed information on it and all the many other points connected with it, we must refer our readers to the large work in which he has embodied the results of his investigations, "*Die Sabier und der Saabismus*" (3 vols. St Petersburg, 1856). See also NEO-PLATONISTS, GNOSTICS.

ZACATECAS, capital of the Mexican state of that name, is situated in the windings of a deep valley or ravine, between high hills, about 520 miles north-west of Mexico. It is built over a vein of silver, which has been deeply explored. The streets are narrow and crooked, but it has a fine appearance from a distance, owing to the size and massiveness of its churches, and the elegance of some of its residences. There are also a college, a gunpowder mill and a mint. Pop. 30,000.

ZACHARIAS, a Roman pontiff, successor of Gregory III. in 741, who is noticeable as one of the series of Greek prelates by whom the destinies of Rome and Italy were much influenced in the 7th and 8th centuries. The name of Z., moreover, deserves honourable mention in connection with a work of benevolence and charity, which the Roman Church afterwards consecrated by intrusting it to a special religious order—viz., the redemption of captives from the pagan masters by whom they had been held in slavery. During the troubles arising out of the Lombard invasion, Z., by his interposition in more than one instance in favor of the city of Rome with the Lombard kings, contributed to that prestige of the Roman see, which eventually led to its obtaining the leadership of Italy, and in the end the temporal sovereignty of Rome and the adjoining territory. Z. died at Rome on the 14th March 752.

ZADO'NSK, a town of Russia, in the government of Voronej, 60 miles north of the town of that name, and about 230 south of Moscow, on the left bank of the river Don. Pop. (1867) 7200. The trade of the town is not extensive, owing to the close neighborhood of the commercial towns Eletz and Voronej. The manufactures are insignificant. Z. possesses a renowned cloister.

ZAFARA'N-BO'LI, a town of Asia Minor, in Anatolia, about 190 miles east-north-east of Scutari, at the junction of two small affluents of the Chât-su. It has four handsome mosques, a church, large baths and khans, and extensive suburbs. It has a considerable trade in saffron (whence its name), which is cultivated extensively in the surrounding country. Pop. supposed to be about 15,000.

ZAFFRE, crude oxide of cobalt, made by roasting cobalt ore and reducing it to powder, with the addition of about three parts of the finest white sand used by glass-makers. It is extensively prepared in Saxony, and is often imported into Britain. When fused into a glass, it is intensely blue, and is much used by enamellers and porcelain manufacturers as a blue color.

ZÄ'HRINGEN, a small village near Freiburg, in Baden, in the Breisgau, formerly a province of Austria, but annexed to Baden in 1805. It is historically noteworthy for the ruined castle from which the Dukes of Zähringen took their name, the ancestors of the reigning House of Baden (q. v.). The Hapsburgs (q. v.) are traced to the same stock. Guntram or Gunthrun the Rich, Count of Breisgau—son of the famous Erchanger, who raised himself to the dignity of Duke of Swabia and was beheaded for treason in 917—is assumed as the founder of the House of Zähringen. The Zährings claim to be descended from his eldest son, Gebhard; the Hapsburgs, from the younger, Langelin. After the death of Duke Berthold I. 1077, the House was divided into two lines—the ducal or Zähring line, which became extinct in the male line in 1218, with Berthold V., the founder of Bern; and the markgraf or Baden line, from which the present House of Baden

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is descended. The ducal Zährings exercised a beneficent sway over a great part of Switzerland.

ZAIRE. See CONGO.

ZA'MA, a city and fortress in Numidia, about 800 miles south-west of Carthage, near which Hannibal was defeated by the Younger Scipio, 201 B.C. The flower of Hannibal's forces consisted of a small veteran army, that had shared his fortunes for many years; most of the rest were of inferior quality, of many races, variously organised, and of suspicious fidelity. But his greatest deficiency was in cavalry, an arm with which he had repeatedly decided the victory in former battles. In Scipio's army, on the other hand, Numidians, under Masinissa, were present in overwhelming numbers. The onset of Hannibal's elephants, of which he had 80, was defeated and made worse than useless by the wise precautions of Scipio; the cavalry on his flanks were scattered by the furious charge of Masinissa and Lælius; his front line of mercenaries beaten back by the more numerous and better-disciplined Romans. His veteran infantry, hemmed in on all sides, fought with the courage of despair, and were cut to pieces. Hannibal having done everything, both before and during the battle, which could secure the victory, escaped with a few horsemen. Of the Carthaginians, 20,000 were left dead on the field, and an equal number taken prisoners. Of the victors, 3000 fell in the action.

ZAMBEZI RIVER AND REGION. The extensive region in South-east Africa known to medieval geographers under the general name of the empire of Monomotapa, is shewn on old maps as drained by a river called Zambesi, or Zambeze, on the banks of which appear large towns, of which the mythical "Vigita Magna" was supposed to be the most famous. The course of the stream, which is the modern Z., is, however, pretty correctly delineated, and even a small lake is shewn in connection with it, not far from the real position of Lake N'gami, whose existence we only became aware of a few years ago, and which we now know may be considered one of the most southern collections of inland waters which communicate with the Z. River and the more eastern lakes. The Nyassa or Maravi, as well as the more northern lakes, Victoria Nyanza and Tanganyika (the latter in connection with the Nile basin), are also given with such a degree of accuracy that it plainly shews, that in compiling these early maps, the distinctive features of the region must have been well known—principally, it is supposed, from Arab sources, various settlements of that people inhabiting the east and south-east coast of Africa from the Red Sea to Sofala.

Although the lower region of the Z., for a distance of at least 800 miles from its mouth, has been in possession nominally of the Portuguese since the beginning of the 16th c., forming the captaincies of Rios di Senha, Tete, and Quilmane, yet it is only within the last few years, through the indefatigable exertions of Dr Livingstone (1851—1856, and 1858—1864), Mr Oswell, Dr Kirk, Mr T. Baines, Mr James Chapman, Charles Anderson, and other intrepid African explorers, that we have got anything like an accurate or scientific idea of this vast region, which extend from 8° to 21° of s. lat., and from 14° to 87° of e. long.; and the total length of what may be considered the main stream (called Leambye in its upper course), from its mouth to the point shewn on Dr Livingstone's map, where the Leeba River, which proceeds from Lake Dilolo—on the summit of the watershed which divides the rivers running north-west into the Atlantic from those running south-east into the Indian Ocean—joins it, cannot be less than 1200 miles.

The river-basin of the Z. is coterminous, on the north, with a large area of the Congo River system, and the great lakes that drain into it; on the south and west, an obscurely marked watershed, crossing the Kalihari Desert, separates it from the Orange River basin and the rivers that run through Ovampo Land into the Atlantic; while on the south-east, a well-defined mountain-range divides the rivers flowing into the Z. from those which form the Limpopo River running into the Indian Ocean.

The name of Z. is preserved from the mouth of the river, or rather a short distance above it, to the junction of the main stream with the Chobe, in lat. 17° 31' s., long. 28° 13' e., which connects it with the sluggish inoculating streams of the N'gami region; from thence it is called Leambye; and its course has been only laid down with any pretension to accuracy as far as its junction with the Leeba (lat. 14° 10' s., long. 23° 35' e.), when it appears to turn suddenly to the north-east, forming

a vast network of streams, which anastomose with one another, and appear to form several other connections with the main stream, far to the eastward, through the Kafue, Loangwa, and other branches, at least if native reports can be trusted. Of the more remote sources of the main stream, except lake Dilolo, we know nothing. The lake itself seems to have an outlet both to the north and to the south. The northern outlet most probably finds its way into one of the great southern tributaries of the Congo; in which case the lake stands on the watershed between Zambesi and Congo, between the Atlantic and the Indian Oceans.

In the region where the Leeba joins the Leambye, the main stream is often as wide as the Thames at London Bridge, and perhaps as deep. From the confluence to the Victoria Falls, there are many long tracts over which vessels as large as the Thames steamers could freely ply. But there are serious obstacles in the way of anything like navigation for hundreds of miles at a stretch—as seems now to be possible on the Congo (Livingstone) above the Yellala Falls. Large areas in this region are liable to be flooded, and to stand under water for considerable periods at a time.

This part of Central South Africa may be considered as an extensive plateau or table-land, from 8000—4000 feet above the sea-level, with an outer fringe or border of basaltic rocks, cutting through which, the Z. River forms one of the most striking scenes in the physical geography of the universe—namely, the Victoria Falls of Livingstone, or Moslotunya, or “Smoke sounds there,” of the natives. Here, a few miles to the east of where the Ohobe joins the Z., the latter—a stream of 1000 yards in width—plunges down into a chasm more than 100 feet deep, forming an immense crack in the basaltic rock at right angles to its course, and is carried along in a narrow channel some 80 miles in the same direction, between steep basaltic rocks, scarce 100 feet apart from each other.

The whole of this vast country, both north-east and west of the upper course of the river, is very imperfectly known; but it is ascertained that the Okavango of Anderson, formerly supposed to be one of the branches of Cuanene River, is connected with the Z. basin. As we descend the river to the ocean, it runs in a south-east course, varying in width from 600 yards to two miles and more, in the rainy seasons. From the Portuguese town of Tete downwards it is navigable, although with difficulty in the dry season; and it passes through one or two narrow rocky gorges in the Lupata Mountains, which form ugly rapids, except when the river is in full flood. About 60 miles from the mouth, it receives from the north the waters of the Shire, which runs out of Lake Nyassa, the Maravi of old geographers, an extensive sheet of water above 800 miles long, and 50 miles across at its widest part, extending between lat. 11°—14° 30' S., and it enters the low country about 50 miles from the ocean, where it divides into many branches, forming a large delta, of a very unhealthy character. The most northern stream is called the Kwaka, or Kilimane, or Quillimane River; and the most southern and deepest channel the Luabo. At Kilimane, or Quillimane, about 18 miles from the sea, is the residence of the Portuguese governor of the region; but there are various other entrances used by slavers and contrabandists, which are not very accurately laid down in our charts; and it is both difficult and dangerous to enter the river without a competent pilot.

The Victoria Falls are estimated to be 3,500 feet above the sea-level. Tete is considered to be 400 feet; and the rapids of Lake Nyassa, where the Shire issues from it, are 1553 feet above the same; while Lake Shirwa, a smaller lake, south-east of Nyassa, is 2,000 feet.

The natives inhabiting the coast region drained by the Z. must be considered of the pure negro type; while the Makololo, who are found in the central and upper country, belong to the Betjuana family, or rather, are a sort of link between it and the negro. They are, however, to be regarded as conquerors of the original tribes, called Makalaka, who may be classed as negroes, and are still numerous. The Zulu tribe of Amatabele, under Mosilikatze, who inhabit the high region dividing the Limpopo from the Z. basin, have overrun and conquered nearly all the tribes south of them. The slave-trade is actively carried on in the countries nominally claimed by the Portuguese; unsuccessful attempts were made a few years ago to plant an episcopate and civilise the natives through the influence of missionaries. The native population may be considered large, as compared with that of the Cape Colony or Betjuana Country.

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Zanzibar

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All the usual tropical productions are found, but owing to the disturbed state of the native tribes, are but little cultivated. The animal kingdom is very similar to that of the adjacent regions of South Africa; and an immense quantity of Ivory is exported both from the west and east coasts. The prevalence of the Tsetse (q. v.) makes travelling difficult in the interior. Extensive coal-fields exist, and gold is found in the neighborhood of Tete and Senna.—Vide the "Travels" of Livingstone, 1st and 2d parts; T. Baines's "Explorations," Andersson's "Okavango," and various articles in "Journal of Royal Geographical Society;" "The Victoria Falls" (1866) and to the "Victoria Falls of the Zambesi," by Ed. Mohr (London, 1876).

ZAMIA, a genus of plants of the natural order *Cycadaceæ*, of which the species are found in the tropical parts of the world. They have a tree-like stem, with a single terminal bud and pinnate leaves. The wood consists of concentric circles, with very loose cellular zones between them. The male and female flowers are on separate plants, in tessellated catkins, the scales of which differ in form in the male and female plants. The central part of the stem contains much starch, especially in old plants, and a kind of sago or arrowroot is made from some of them. The central part of the stem of the Bread-tree (*Z. cycadia*), of South Africa, which is about six or seven feet high, with a scaly stem, is much used as an article of food by the Kaffirs and Hottentots, who prepare it by wrapping it in a skin well rubbed with grease, burying it in the ground until it undergoes putrefaction, bruising it between two stones, making it into cakes, and baking it in wood-ashes. There are numerous fossil species of *Zamia*. Closely allied to it is the fossil genus *Zamia*.

ZAMIOSTROBUS, the generic name given to several cones from the Secondary and Tertiary strata, because they were supposed to be the fruits of fossil *zamias*. But Mr Carruthers has shewn ("Journal of Botany," January 1867) that they belong to true Coniferae. He has, however, in the same paper, described six species of fruits belonging to *zamia*-like cycads, to which he has given the generic title of *Cycadostrobus*. They are all from the Secondary rocks. No cycadean remains whatever have yet been found in newer deposits.

ZAMITES, the generic name under which are included numerous forms of *zamia*-like leaves which occur in Secondary strata. No certain traces of the trunks have yet been found associated with them, and only one species (*Z. gigas*) is accompanied with fruit, and this is so anomalous that it casts considerable doubt on the determination of the affinities of the foliage.

ZAMORA, a very ancient town of Spain, capital of the province of that name, is situated 40 miles north of Salamanca, and 132 north-west of Madrid, on the right bank of the Douro, which is here crossed by an old stone bridge. It is the see of a bishop suffragan of Santiago. Z. was of great importance in the Moorish times, and is said to have been enclosed by seven lines of walls, with a moat between each. It is entered by seven gates, is surrounded by a wall, has a massive square tower with Norman arches, and many interesting remains of mediæval architecture. *La Magdalena*, a church of the Templars, but afterwards belonging to the order of St Juan of Jerusalem, is a simple solid edifice of the 12th c., slightly modernized. There are 90 other churches, besides a theological school, barracks, a prison, a normal and other schools, a library, museum, &c. It has manufactures of serges, linens, leather, hats, liquors, brandy, and a considerable trade in wine and grain. Sir J. Moore urged the Junta of Salamanca to repair the defences of Z., and receive there his stores, but his retreat had commenced before they had done deliberating. Had Z. been made tenable, Moore would have fallen back on it, instead of on Corunna. The French afterwards got possession of it, and although no resistance was made, the town was sacked, neither age nor sex was spared, and the principal persons were executed. It was again plundered by the French, and has never recovered these visitations. Pop. 16,000.

ZAMOSC, one of the most strongly fortified towns of Russian Poland, in the government of Lublin, 45 miles south-east of Lublin, and 140 south-east of Warsaw, surrounded by water and a marsh. All the houses are built in the Italian style with arcades. There is a large and beautiful castle opposite the former university, town-

hall and arsenal, four churches, monasteries, theatre, &c. There are beer and porter breweries. Pop. (1867) 6467.

ZAMOUSE (*Bos brachyceros*), a species of ox or buffalo, found in the tropical parts of Western Africa. It is the *Bush Cow* of Sierra Leone. It differs from the Buffalo and all other *Bovides* in several important particulars, especially in the very large size and peculiar fringing of the ears, and in the total want of dewlap. The forehead also is flatter than that of the buffalo. The color is nearly uniform, a pale chestnut. The hair is thin, and nearly erect. The ears have three rows of long hairs springing from the inside, and a tuft of long hairs at the tip. There is a considerable space on the forehead between the horns, which are not long, extend outwards and upwards, are suddenly incurved, and very sharp.

ZANESVILLE, a city of Ohio, U. S., on the left bank of the Muskingum River, and opposite the mouth of Licking River, 54 miles east of Columbus, is a regular well-built town, in a beautiful and fertile valley, with steamboats to the Ohio, and several railways. An iron railway bridge of 538 feet crosses the river, and bridges connect it with its suburbs, Putnam and South and West Zanesville. It has abundant water-power, and rich coal and iron mines; cotton, woollen, nail and glass factories; iron foundries, 22 churches, public and free high schools, 5 or 6 newspapers; &c. Pop. (1860) 9229; (1870) 16,011; (1880) 18,113.

ZANGUEBAR. See ZANZIBAR.

ZANTE (ancient *Zacynthus*), one of the principal Ionian Islands, about 9 miles from the west coast of the Morea, and 8 south of Cephalonia, is about 24 miles long, 12 broad, and has a superficies of 156 sq. m. The greater part of the island consists of a plain, stretching from north to south, with a breadth of from 6 to 8 miles, bounded on the west by a line of hills. The vine is extensively cultivated on the plain, and the wine produced is considered to be of a superior quality. Currants produced from a dwarf species of vine, originally brought from Corinth, are the staple product, 14,255,764 lbs. being exported in 1876. Pomegranates, olives, melons, peaches, and citrons also are grown. Z. is said to have been colonized by Achæans from the Peloponnesus; and it is mentioned in Homer with the epithet "woody," which, however, is not apt at the present day, although it is justly called, in an Italian proverb, "the flower of the Levant." It is subject to frequent earthquakes, which, it would seem, are likely to recur about once in 20 years. The most notable mineral feature of Z. is its pitch-wells, described by Herodotus, which are situated about 12 miles south of the town of Z., in a marshy district. Pop. (1871) 44,567.—**ZANTE**, the capital, is the largest town in the Ionian Islands, and is situated at the head of a small bay or harbor on the east coast, on the site of the ancient town, of which the only remains are a few columns and inscriptions. The houses stretch along the semi-circular outline of the bay to the distance of a mile and a half, and extend up the slope of the castle-hill. Most of the streets are narrow, but clean, and the older houses built in the picturesque Venetian style; the huge lattices of wooden frame work, resembling those employed in eastern harems, with which the windows used to be fitted, are being rapidly abolished. The principal street is broad and handsome, the churches are numerous, and the market-place spacious. The harbor of Z. has been greatly improved of late years; it is now protected by a long mole, and has a light-house, but is still somewhat exposed and insecure. A magnificent and extensive view is obtained from the citadel in the highest part of the town. Z. is the see of a Greek protopapas, and of a Roman Catholic bishop. Pop. 20,000.

ZANZIBAR, or Zanguebar. The territories of the Sultan of Z. comprise all that part of the east coast of Africa included between Magdashooa, situated in 2° n., and Cape Delgado in 10° 43' s. lat. They are bounded on the n. by the independent tribes of Somal and Gallas, and on the s. by the Portuguese province of Mozambique. The extent of the coast is about 1100 miles, and parallel to it are numerous islands, the most important of which are Zanzibar, containing the capital of the same name, Pemba, and Máfia (Mondia on the charts). The territories on the mainland have no defined limit towards the interior, being occupied by heathen tribes, over whom the sultan's authority is hardly even nominal beyond the sea-board. The soil along

Zanz
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the coast is fertile in rice, millet, peas, beans, melons, pumpkins, the sugar-cane, cocoa-nut, banana, plantain, &c., and the forests supply the caoutchouc tree and many valuable species of timber. Cattle, sheep, and fowls are plentiful, and tropical wild animals abound. Rice, sugar, molasses, ivory, gums, gold, and cowries are exported. The heat on the coast is excessive, and the climate very unfavorable to Europeans. The name Z. is applied to the coast from 4° n. to 12° s.

The island of Z., by far the richest and most important part of the sultan's dominions, is distant from 20 to 30 miles from the African coast; it is about 48 miles in length, and from 15 to 30 in breadth. It contains an area of about 400,000 acres, and the soil is in most parts of exceeding fertility; being covered with woods and plantations, and the frequent rains causing perpetual verdure, it everywhere presents a delightful appearance. It is very flat, the highest point being not more than 300 feet, composed entirely of coral, and abundantly watered by rivulets, which flow at all seasons of the year. The principal products are cocoa-nuts, cloves, rice, sugar-cane, manioc, millet, and fruits in the utmost abundance, especially oranges of the finest quality, which can be purchased at the rate of 1000 for four shillings. The island is intersected by paths and green lanes in every direction, affording a never-ending variety of pleasant walks and rides. The country-houses of the Arab proprietors, and the huts of their slaves, are thickly dotted over the surface, surrounded with gardens and fields. The hedgerows are covered with flowering creepers, and pine-apples grow amongst them in wild profusion. In many parts are glades of undulating grass-land, of park-like appearance, dotted with gigantic mango trees; the ponds are covered with rushes and water-lilies; and the air is perfumed with the blossoms of the orange and clove. The pop. of the island is estimated at about 100,000. The town contains about 60,000 permanent inhabitants; while probably from 20,000 to 40,000 strangers come from Arabia, India, and the northern parts of Africa during the season of the north-east monsoon. The chief people are the Arab landed proprietors, who form a sort of aristocracy, possessing large plantations and numerous slaves; besides these, there are slaves, free blacks, natives of the Comoro Islands and Madagascar, and 5000 to 6000 natives of India, who keep nearly all the shops in the town, and through whose hands nearly all the foreign trade of the place passes. The language of the court and of the Arab population is Arabic, while the slaves and the free black population speak a dialect called *Kiswahili*, one of the great family of South African languages.

The climate of Z. is extremely equable and salubrious, the thermometer having probably never risen as high as 90°, nor fallen lower than 70°. Nearly 200 inches of rain fall during the year, of which half at least falls in March, April, and May.

The capital is extensive, but, like most oriental towns, it is narrow, irregular, and ill built; the houses of the principal inhabitants, and of the European residents, are large flat-roofed buildings, generally with an interior courtyard; and some of them, and especially the palace of the sultan, may almost claim to be magnificent.

The trade is very considerable. In 1875 it was estimated as follows: Imports, £600,000; exports, £530,000. The imports consist of cotton goods, brass wire, beads, arms, &c.; and the exports of gum-copal, cloves, ivory, cocoa nut oil, sesame, dyestuffs, and a great variety of other articles.

The sultan has a small standing army of about 1400 paid soldiers, capable of increase by conscription and recruiting. The fleet, which, in 1871, consisted of a sailing frigate of 34 guns, 1 corvette (21 guns), 1 steam corvette (9), and 2 yachts (6 and 4 guns), was almost entirely destroyed in the hurricane of 1872. The earliest settlement of Arabs on the east coast of Africa occurred about 924 A.D.; and for several centuries, flourishing republics, governed by elders elected by the citizens, existed along the coast. Vasco da Gama visited Z. in 1499, and in 1503 the dominion of Portugal was recognised by the inhabitants, who agreed to pay an annual tribute; but the Portuguese never held it for very long periods. About 1735 A.D., they were finally expelled, and in 1784, the island was taken by the Imam of Muscat, in whose family the government remained until the death of Seyed Saced bin Sultan, in 1864, when the Arabian possessions fell to his son, Seyed Thoweni, and Z. and its dependencies to Seyed Majid (died 1870), elder brother of the present ruler, Seyed Barghash, who has entered into treaties with Great Britain for the suppression of the slave-trade, and who visited England in 1875.

ZA'RA (ancient *Jadera*), the chief town of Dalmatia, on the coast of the Adriatic, 73 miles north-west of Spalatro, and about 123 south-east of Trieste. The town is strongly fortified, and is built in the form of an oval, on a narrow promontory, separated from the mainland by a moat, across which is a drawbridge. The town is entered by two gates, one from the sea, called *Porta Marina*, supposed to be partly of Roman construction; and one from the landward side, called *Porta di Terra Firma*. The ramparts, of Venetian construction, and partly planted, afford a fine promenade to the inhabitants. There is a spacious and well protected harbor, which, however, is somewhat shallow. The streets generally are narrow and ill paved, and the drainage defective; the town is not well supplied with water. Of its churches, the most noteworthy are its cathedral, founded by Henry Dandolo, Doge of Venice, and the church of the patron saint, St Simeon. There are many convents and monasteries; a lyceum, gymnasium, and other schools; a barracks, and a naval and military arsenal; hospitals, a theatre, museum, and other public buildings. There is a lofty marble column, which is all that is left standing of an ancient Roman temple; there are also the remains of a Roman aqueduct. Z. is the seat of the government of Dalmatia, and the see of a Roman Catholic archbishop. The commerce is unimportant. Many of the inhabitants are engaged in fishing and in the coasting-trade. The chief manufactures are rosoglio, maraschino, leather, silk and linen fabrics. Pop. (1869) 8014, Italians by descent, and speaking the Italian language. Anciently, Z. was the capital of Liburnia, in Illyricum; and under Augustus it was made a Roman colony.

ZARAGOZA. See **SARAGOSSA**.

ZARAI'SK, a Russian town, in the government of Riazan, 32 miles north-west of the town of Riazan, and 80 south-east of Moscow, a few miles from the right bank of the Oka, a tributary of the Volga. The town was founded in the 18th c.; and in 1681, Ivan the Terrible erected on the site of the old fortification a strong fortress, which thrice resisted the assaults of the Tartars, and which still exists. Another noteworthy object is the Cathedral of St Nicolas, which dates from 1681. There are manufactures of soap and candles, as also several tanneries and breweries; these, however, produce only sufficient to meet the wants of the inhabitants. The commerce of the town has greatly declined since 1847, when the new road of Riazan was opened, leaving Z. out of the way. Pop. (1867) 5165.

ZA'RSKOE-SE'LO, or Saint Sophia, a town of Russia in the government of St Petersburg, and seventeen miles south from the city of St Petersburg, with which it is connected by a railway. It has a college and a military school. The palace of Z. is a summer residence of the emperor, founded by Peter the Great in 1710, and the favorite abode of Catherine II. The church of St Sophia is a miniature copy of the mosque of that name at Constantinople. Pop. in 1867, 6741.

ZE'A (ancient *Ceos*), an island of the Grecian Archipelago, one of the Cyclades, 13 miles east of Cape Colouno; 14 miles in length, and 8 in greatest breadth. It is somewhat egg-shaped. Its surface rises from the coast in terraces, culminating in the centre in Mount St Elias, whose lat. is $37^{\circ} 37'$ n., and long. $24^{\circ} 21'$ e. The climate is healthy, and the soil fertile. The products are wine, fruit, barley, cotton, and silk. Attention is paid to the rearing of cattle and silkworms. Pop. 4000. Pliny says that Z. was once united to Euboea, but that four-fifths of it were carried away by the sea. Z. was the birthplace of the lyric poets Simonides and Bacchylides. The island once possessed four towns, but there is now only one, *Zea*, situated on the north-west slope of the hill, about 3 miles from the coast, on the site of the ancient *Iulis*, of which the most important remains is a colossal lion, about 20 feet in length, lying a short distance east of the town. A few remains are also still to be found on the sites of the other three ancient towns. The harbor of Z., Port St Nicholas, about 3 miles from the town, admits the largest vessels, and is well frequented.

ZE'A. See **MAIZE**.

ZEBI'D, a town of Arabia, district of Yemen, on the river Zebid, 15 miles from its mouth, 115 miles south-west of Sanaa, and 60 north of Mocba. The town is of great antiquity, on account of which and of the dark color of the bricks of which it is built, it has a somewhat gloomy appearance. Z. is strongly fortified, being sur-

Zebra
Zedekiah

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rounded by high walls, said to be a league in circuit, flanked with numerous towers. It possesses a large mosque, with an elegant octagonal tower. Z. was formerly a place of much commercial, but it has declined into comparative insignificance, owing to the accumulation of sand in the mouth of the river. Pop. 7000.

ZE BRA, a name sometimes given to all the striped *Equidae*, all of which are natives of South Africa, and thus including the Danw (q. v.) and Quagga (q. v.); but also, in a more restricted use, designating a single species, *Equus* or *Asinus Zebra*, a native of the mountainous districts of South Africa. In the whole group, the characters more resemble those of the ass than of the horse; the tail is furnished with long hairs only towards the tip, and the hind-legs are without warts; the neck is full and arched, the mane stands erect. The Z. is about 13 hands high at the shoulder. It is of a light and graceful form, with slender limbs and narrow hoofs; the head light, the ears rather long and open; the ground color white, or slightly tinged with yellow; the head, neck, body and legs striped with black, the neck and body transversely, but not regularly; the hind with bands in various directions, the legs with irregular cross stripes. The Z. lives in small herds, inhabiting the most secluded spots. Its senses of sight, smell, and hearing are very acute, and the least alarm is sufficient to make a whole herd scamper off, with pricked ears and whisking tails, to inaccessible retreats among the mountains. When attacked, however, and compelled to defend themselves, Zebras do it vigorously, the herd forming in a compact body, with their heads towards the centre, and their heels towards the enemy, repelling even the lion and leopard by their kicks. The Z. has been domesticated, and used as a beast of burden, but generally shews a vicious and untractable disposition. The flesh is eaten by the natives and hunters of South Africa. A hybrid has been produced between the Z. and the ass.

ZEBU', one of the Philippine Islands (q. v.).

ZEBU, Indian ox, or Brahmin ox, a kind of ox, very nearly allied to the common ox, of which naturalists generally regard it as a mere variety, although some think it a distinct species (*Bos Indicus*). The most conspicuous distinctive character, is a large fatty hump on the back, above the shoulders. The legs are rather more slender and delicate than in the European ox. The hump attains a very great size in animals plentifully supplied with food, and not compelled to work; in those which are ill fed or hard worked, it is comparatively small. It is alleged that intermixture takes place freely with the common ox, and that there is no difference of anatomical structure, but these statements require verification. Mr Vasey found the number of caudal vertebra in the Z. to be only 18, whilst in the common ox it is 21. The period of gestation in the Z. is also said to be 300 days, whilst in the common ox it is 270. The Z. is diffused over India, China, the Asiatic Islands, Madagascar, and the east coast of Africa. There are many breeds, differing very much in size; the largest being larger than any oxen of Europe, whilst the smallest are not much larger than a large mastiff. The hump of the largest breeds is said to be sometimes 50 lbs. in weight. English residents in India esteem the hump as delicious for the table. There are hornless breeds; but most of the breeds have short horns. There is a breed with two fatty humps, one placed immediately behind the other, which is common in the vicinity of Surat. The voice of the Z. resembles the grunting of the yak, almost as nearly as the lowing of the ox. The Z. is used in India both as a beast of draught and of burden. It is yoked in the plough. It is occasionally used for riding. It can travel from 20 to 30 miles a day. It is very gentle and docile.

The Brahmin or sacred bulls of the Hindus, consecrated to Siva, are all of this kind of ox. They are caressed and pampered by the people, and to feed them is deemed a meritorious act of religion. The Brahmin bull may go where he pleases; it is not lawful to beat him, even if he be eating a valuable crop, or if he enter a shop and devour the articles exposed for sale. He soon learns to despise shooting, which is the ordinary expedient to drive him away, and makes himself at home everywhere.

ZECCHI'NO. See **Ducat**.

ZECHARI'AH, called in the book of prophecy which goes under his name, "the

son of Berechiah, the son of Iddo," but in Ezra, "the son of Iddo," was born in Babylonia during the captivity, and accompanied the first band of exiles on their return to Palestine under Zerubbabel and Joshua. Very little is known of his personal history, but enough to assure us that he was a man of influence and a leader among his countrymen. He combined in himself the offices of priest and prophet. Ezra expressly ascribes to Haggai and him the merit of stirring up, by their prophetic inspiration, the patriotic enthusiasm of the Jews to complete the rebuilding of the Temple. Later traditions, which are probably more or less in the line of historic fact, state that he assisted in providing for the service of the Temple (various of the liturgical psalms being ascribed to him), and that he was a member of the great Synagogue (q. v.).

The prophecies of Z. may be divided into three parts: the first (chapters i.—viii.) consists mainly of a series of visions relating to the building of the Temple, the glory of the city, the removal of all abominations out of the land, &c., and winds up with a prediction that Jerusalem will become, as it were, a centre of religious worship to all the world. The second (chapters ix.—xi.) threatens Damascus and Phenicia, and the cities of the Philistines with ruin; predicts that Judah will be greater than Javan (Greece), that Israel and Judah will be reunited—though almost immediately he symbolically shows the impossibility of this—and that both Assyria and Egypt will be humbled. The third part sets forth that dark times for Judah are drawing nigh, which shall be as an ordeal for the nation. After sore trial, it shall come forth thoroughly purged from iniquity, and then the Lord will appear in his glory on Mount Olivet, fight victoriously against the hosts of heathendom, and compel all who are not destroyed by his wrath to worship Him at Jerusalem. A millennium of holiness will then begin: "In that day shall there be upon the bells of the horses, 'Holiness unto the Lord' . . . yea, every pot in Jerusalem and in Judah shall be holiness unto the Lord of hosts" (xiv. 90, 91).

Numerous biblical critics, both in Germany and England, consider the first part only to be the work of Z., and it cannot be denied that the internal evidence strongly favors this supposition. There is a unity, consistency, and sequence in the visionary predictions, and a harmony both of style and matter—the imagery bearing very distinctly the impress of those two master-spirits of the exile, Ezekiel and Daniel—that no candid critic can overlook, while the remaining chapters are totally unconnected in subject with what precede; contain no allusion to the post-exilic age, and speak of idols and false prophets in a way that would be utterly meaningless if applied to the times subsequent to the return from the captivity. The style also is quite different; is softer, richer, more poetical. The spirit of Ezekiel is exchanged for that of Jeremiah or the younger Isaiah. Whether these chapters are the work of one or two authors, has also been elaborately discussed, the evidence being, on the whole, in favor of the latter view.

ZEPHSTHON (Ger. mill-stone), a deposit of calcareous rock which covers the Kupferschiefer, and which received this name because it must be cut through before reaching the mineral-bearing beds beneath. It is the equivalent in Thuringia of the fossiliferous limestones of Permian age of the north of England.

ZEDEKIAH, originally Mattaniah, the last king of Judah, son of the "good Josiah" by his wife Hamutal, succeeded his nephew Jehoiachin. The latter having rebelled against his master, Nebuchadnezzar, king of Babylon, was besieged in Jerusalem, and taken prisoner, after a brief reign of three months. Nebuchadnezzar bestowed the vacant throne on Z., doubtless in the expectation of securing a faithful vassal. If so, he was mistaken. Z. was a weak unwise ruler, probably incapable of political fidelity: in the phraseology of the Jewish historian, "he did that which was evil in the sight of the Lord." Forgetting his obligations to the Babylonian monarch, he lent a ready ear to the foolish braggadocio of the nobles and princes of Judah, and in spite of the earnest and reiterated remonstrances and warnings of Jeremiah, finally consummated his perfidy by forming an alliance with Egypt, the hereditary enemy of Assyria and Chaldean. Swift destruction overtook the traitor. A Babylonian army invaded and ravaged the country, besieged Jerusalem, and after inflicting a crushing defeat on an Egyptian force that was marching to the relief of the city, reduced the inhabitants to such horrible extremities, that they could no longer hold out. Z., accompanied by his wives and children, fled in the darkness of

Zedoary
Zelaya

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night towards the Jordan, but was overtaken and made prisoner near Jericho. The monarch and his sons were sent to Riblah, at the north end of the valley of Lebanon, where Nebuchadnezzar then abode. The conqueror, with customary Asiatic cruelty, ordered the sons to be slain before their father's face, and then deprived the wretched parent of his eyesight. Thus maimed, and bound with fetters of brass, he was conveyed to Babylon (588 B.C.), where he probably died. The Temple and city were destroyed, the inhabitants carried off into captivity, and the kingdom of David and Solomon ceased to have a place on the earth.

ZEDOARY (Arab. *Jedwar*), the name of certain species of *Curcuma* (see TURMERIC), natives of the East Indies, the root-stocks (*rhizomes*) of which are aromatic, bitter, pungent, and tonic, and are used for similar purposes with ginger. They are more used in the East than in Europe, but are imported in small quantities, and sold under the name of Zedoary. The ROUND Z. of the shops is the produce of *Curcuma zedoaria*, a native both of India and China, having palmate root-stocks, straw-colored within. LONG Z. is produced by *C. zerumbet*, a native of various parts of the East Indies, having long palmate root-stocks, yellow within. Z. is a powerful sudorific.

ZEE'LAND, a province of the Netherlands, consists of the islands Walcheren, North Beveland, South Beveland, Schouwen, Duiveland, Tholen, West Flanders, and East Flanders. It lies between 51° 20'—51° 45' N. lat., and 3° 21'—4° 15' 54" E. long., and has an area of 665 sq. miles. The boundaries are: South Holland on the N., the Easter Scheldt on the E., Belgium on the S., and the North Sea on the W. Pop. (January 1, 1875) 184,515. In 1874, births, 7593; deaths, 2665; marriages, 1527. Nearly three-fourths are Protestants, having 188 churches; the remainder, except 670 Jews, with 4 synagogues, are Roman Catholics, who have 86 places of worship. The provincial capital is Middelburg. Other important towns are Flushing; Goes (pron. *Huse*), in South Beveland; and Zierikzee, in Schouwen. The greatest part of the soil, which is a rich clay, has been redeemed from the sea; and almost in the centre of Walcheren, South Beveland, and Schouwen, there are seen still the high mounds of earth called "hills of refuge," which the early inhabitants formed as places of safety for themselves and cattle when a high tide burst over the newly acquired lands. The number of Polders (q. v.), or drained districts, in the province amounts to about 400. It is almost entirely arable, and produces the finest crops of wheat, barley, oats, rye, peas, beans, colza, beet, flax, hemp, canary-seed, mangolds, &c. Potatoes are extensively planted; and madder for the manufacture of dyeing material forms a valuable agricultural product. Horses, horned cattle, sheep, swine, and goats, are the stock. In many districts of Z., extensive orchards beautify the farms.

The neighboring seas abound with fish, and in Schouwen, many eggs are collected, myriads of water-fowls resorting thither to form their nests. The principal industries, apart from agriculture, are the preparing of madder for the market, weaving calicos, rope-spinning, ship building, beer-brewing, soap-boiling, making vinegar, salt, starch, tobacco, tile and brick, tanning leather, grinding corn, sawing wood, &c. The people of Z. are kind and hospitable, and in the country parishes, are much attached to their fairs, meetings for merry-making, and other old customs, which might with advantage be given up. Few marriages take place among the agricultural portion of the population till absolutely necessary, but a case of desertion rarely occurs, as it would utterly disgrace the young man who did so.

On the 15th of October 1866, a fine ship-canal through the island of South Beveland was opened, and takes the place of the Easter Scheldt. A railway from Flushing, through Walcheren and S. Beveland, communicates with the main Belgian lines at Roosendaal, and by Breda leads to Rotterdam, Amsterdam, or Germany.

ZEITHUN, a town and district in the highlands of Cilicia, lying in 37°—38° N. latitude, and 34°—35° E. longitude, inhabited by a community of Armenian Christians, virtually independent of the Turkish government, and forming in fact an Asiatic republic. Z. lies in the upper basin of the Jyhan or Pyramus, where that river crosses the Taurus Mountains in descending from the table-land of Asia Minor to the low plain of Cilicia, which surrounds the north-eastern corner of the Mediterranean Sea. It is surrounded on all

sides by inaccessible crags, except on the east, where it is bounded by the deep channel of the Pyramus. The hills are covered with magnificent pines, plane trees, and evergreen oaks. Springs and brooks, never dried up during the summer, irrigate the meadows in all directions; but the soil, although abounding in patches of great fertility, does not produce grain in sufficient quantity to supply the wants of the inhabitants. The mulberry trees are, however, numerous in the orchards, and give constant occupation to the women and children in feeding silk-worms. The men are chiefly engaged in smelting and manufacturing the iron supplied by the mountains into ploughshares, horse-shoes, nails, &c., which they exchange for corn and other articles at Marash and Kaisariyeh. The language of Z. is a rude dialect of Armenian, in which the only literature consists of popular songs not committed to writing. Education is much neglected among children, who, except when intended for the priesthood, are not sent to school after the age of 10 or 12. The inhabitants, like the kindred race in Armenia, are free from Asiatic vices. They resemble Europeans in their respect for women. Crime is not frequent. No prisons exist, and it is asserted that murder has never been committed in the country for the sake of gain. There may be exaggeration in these statements, but the Zethnians are certainly open-hearted mountaineers. They have, however, shown the greatest jealousy of foreigners; and until 1854, when their country was visited by M. Léon Paul, a French Protestant clergyman, we only knew of them from the statements of Armenian priests, and articles in the Armenian newspapers of Constantinople. Even now, our information about them is rather scanty. The government seems to be patriarchal, vested in elders of the people, with some prerogatives in the priesthood. When a grievance is felt, complaint is made to the priests, who meet in council, and refer the complaint to the elders assembled as a senate: they decide on the course to be taken. All offices are conferred by popular election, the executive power being placed in the hands of four princes. There are 30 villages in the district, and the chief town, Z., is said to contain 20,000 inhabitants. The Zethnians can muster an army of from 7000 to 8000 men to defend the mountains against the Turkish pashas; and they are in alliance with a neighboring Turcoman chief, also independent of the Turks, who brings 10,000 men into the field. Z. is a relic of the Armenian kingdom of Cilicia, founded in the 11th, and destroyed in the 14th century. Since that period, the native populations have been gradually assimilating to the Turks, a change much favored by the extreme facility with which the Turkish language is acquired. It was not till after the Crimean War that the massacres in the East called special attention to the existence of Z. and other Christian communities in the East, which had some claim to European sympathy. An attempt by the Turks to settle Circassians near Z., gave Aziz Pasha of Marash an opportunity of attacking the Christians, and the atrocities committed remind one of the worst excesses of Cawnpore. The inhabitants defended themselves, however, with the greatest gallantry, twice defeating in the field large Turkish forces; and the struggle was at length terminated by the interference of the French and English governments at Constantinople, and the recall of the pasha. Unfortunately, the Turks were allowed to suppress the Armenian newspaper which acquainted the European public with what is taking place at Z., and we have ceased to receive recent information regarding it. An interesting account of the massacres and the defence of Z. will be found in the "*Revue des deux Mondes*" of February 1863. See also "*Spectator*" of 26th August: 1863.

ZEITZ, a walled town of Prussian Saxony, in the government of Merseburg, 28 miles south-west of Leipzig, lies in a pleasant and fruitful district, on a steep slope, on the right bank of the White Elster, over which there is a stone bridge. The town is very old, and has some good old public buildings; a cathedral, and four other churches; a good library, containing 15,000 volumes, besides MSS.; asylums for orphans and lunatics, an old and new castle, &c. There are manufactures of cotton, earthenware, leather, calicos, hosiery, gloves, &c.; several printfields, breweries, and distilleries. In the neighborhood are extensive mineral-oil works. Pop. (1875) 16,436. It is a station on the Thuringian Railway.

ZELAYÁ, a town of Mexico, in the state of Guanajuato, about 120 miles north-north-east of the town of Mexico, on the right bank of the Río Grande de Santiago, which is here crossed by a handsome bridge. It has a fine cathedral, of mixed

Zelkous
Zend

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architecture, with Corinthian and Ionic columns, and numerous other churches and convents, which are rich in works of art. There are manufactures of cotton and saddlery. Horses and mules are bred to a considerable extent in the vicinity. Pop. 14,000.

ZELKOU'A (*Planera Richardi*), a tree of the natural order *Ulmaceæ*, with a straight and erect trunk of 75—80 feet high, one-third of which height is without a branch, a large head, elliptical leaves of 1—8 inches long, and small flowers with bell-shaped perianth, and small roundish dry 2-celled fruit, the cells 1-seeded. It is a native of Georgia, the north of Persia, &c., and is sometimes planted in England. The timber is valuable, the sapwood elastic, the heartwood very hard.—*P. Gmelini* is a low tree, a native of Kentucky, and of some of the more southern states of America.

ZEMINDA'R, the name given to the governors of districts or large towns in India, under the Mogul rule. Many of the zemindars occupied in India a position almost similar to the dukes and counts of Western Europe in the middle ages; they received from their superiors, the nabobs or provincial governors, fiefs of more or less extent, for which they paid a certain due annually, being then exempted from all other imposts whatsoever. The dues paid by the zemindars were of course exacted, with additions, from the ryots or cultivators, and constituted a large part of the imperial revenue. Under the British government, the same system of tax-collection is continued in Bengal, the zemindars in that presidency being looked upon as the hereditary lords or proprietors of their respective districts. The zemindars of the Coromandel district were formerly called *polyghars*. Under the zemindars were the *havidars*, or heads of villages, whose duty it was to collect their share of the tax imposed by the zemindar, and as, like their chief, they took care to collect an additional proportion for themselves, the most atrocious oppression was commonly practised; the "nabob" pillaging the "zemindars," the "zemindar" in turn plundering his "havidars," while the "havidar" more than reimbursed himself at the expense of the Hindu villagers.

ZEND,* the language in which are composed the ancient sacred books of Zoroaster, first became known through Anquetil-Duperron (q. v.). Many scholars of eminence, like William Jones, Meluer, Henning, W. Erskine, and others, warmly contested the age of these writings. They held that the idiom in which they were couched had never been spoken in any part of Persia, but was a Sanscrit dialect which had been introduced from India for sacred use. The so-called Zoroastrian writings, they said, dated from the time of Ardeshir-Babegan, the first Sassanian, in 230 A.D., or had at least been rewritten and redacted at that time. The first who endeavored to lay the foundations for a real grammatical knowledge of Zend was Rask, the Dane, who, in 1816, undertook a journey to India and Persia, in order to make researches into the origin and nature of this language on the spot. Although he did not live to make known all the results of his investigations, he yet proved irrefutably that the sacred language of the Parsees was closely connected with that of the Brahmans; or, in other words, that Zend was akin to Sanscrit, and that, like the latter, it had retained some of the earliest formations of the Aryan dialects. Eugene Burnouf followed in his steps. He was indeed the real founder of Zend studies in modern Europe. By the aid of his knowledge of Sanscrit and comparative grammar, he proceeded to decipher, for the first time, the sacred writings of Zoroaster in the original; while Anquetil-Duperron, who first made the "Zend-Avesta" known in a European garb, composed his translation only from a modern Persian translation. Both he and Bopp contended for the independent and ancient existence of Zend, holding that Sanscrit, being a new language which came from the north, was more likely to be derived from the Zend than the latter from Sanscrit.

* Much uncertainty prevails as to the real meaning of the word Zend. The name "Zend-Avesta" (q. v.) is, by the native scholars, understood to mean commentary (*pehlev*) and text, an opinion supported by the most eminent Zend scholar of our day, Dr. Haug. The opinion of Max Müller to the effect that Zend is identical with the Sanscrit *chhandas*—a name given to the Vedic hymns—and *Avesta* = *avasthāna*, a word which, if it occurred in Sanscrit, would mean settled text, requires further confirmation.

The opinion of Hang, the latest, and by far the most successful investigator of Zend language and literature, is, that Zend is almost identical with the most primitive—the Vedic—form of Sanscrit. We shall give in the following sketch the results of his studies, which unfortunately have as yet appeared only in the preparatory shape of essays.

The Zend idiom, in its widest sense, embraces two so-called "Bactrian" dialects, which together with the "West Iranian" languages, i. e., those of ancient Media and Persia, form the stock of Iranian tongues. These tongues were once spoken in what the "Zoud-Vesta" calls the "Aryan countries" (*Airyō danhávd*). The former, the "East Iranian" or "Bactrian" branch, has survived, in its two dialects, in the scanty fragments of the Parsee Scriptures only. The more ancient of them is called the "Gátha dialect," because the largest and most important pieces preserved in this peculiar idiom are the Gáthas, or songs; the younger or "ancient Bactrian," also "classical Zend language," is the one in which the greater part of the "Zend-Avesta" (q. v.) itself is written. Both dialects seem to have died out in the 8d c., A. C., leaving no linguistic progeny. The general character of Zend, in its widest sense, is that of a highly-developed idiom, inasmuch as it is as rich in inflections (there are no less than three numbers and eight cases) as is the Vedic Sanscrit, and is richer even than the Latin in the variety of forms inherent in its verbs and nouns. There are numbers of compound words in it; and the whole syntax bears the stamp of an advanced stage of linguistic progress. A genuine sister of Sanscrit, Greek, Latin, and Gothic, it is yet only known to us, much as is the Hebrew, in its declining phase. The forms are no longer accurately kept distinct, and a return to the originally uninflected state is noticeable, principally in the verbs. It may be that the Bactrian grammar had never been properly fixed by rules, and that, in the absence of that tender care which the Brahmans took of the preservation of the Sanscrit texts and idiom, many corruptions and abbreviations gradually crept from the colloquial into the classical language of Zend, and were thus perpetuated in the surviving remnants. As soon as the language of the Zoroastrian books died out from daily use, these books were mechanically copied, time after time; and any number of blunders, unchecked by an understanding of the structure or the details of the language, crept in unheeded. The oldest copies are the best, comparatively speaking: the more modern the copy, the oftener the terminations are found as separate words; vowels are inserted according to the faulty pronunciation of the writer; and a number of other faults, of omission or commission, are patent at first sight, solely due to carelessness and ignorance. Before indicating the general character of Zend, we shall briefly observe that its two dialects differ both phonetically and grammatically; and the phonetical differences are so great, that, at first sight, it would almost appear as if they were caused by different localities rather than ages, but, on closer inspection, it is found that the slurring of the Gáthas, whereby certain vowels were lengthened out, has caused many of these striking peculiarities. Grammatically, the Gátha dialect shews many deviations from Zend, traceable to the more primitive state of the Bactrian language which it represents. But the differences between the two are not so great as between the Vedic and the classical Sanscrit, and between the Greek of Homer and the Attic dialect. At most, the Gátha may be reckoned to be one or two hundred years older than that classical Zend which formed the classical language of the ancient Iranian Empire, as depicted in the earlier parts of the *Sháh Námah*.

There are twelve simple vowels and about fourteen diphthongs in Zend, for each of which there are special characters. Of vowels peculiar to this idiom, may be mentioned the *ā* long, (with a nasal sound), used chiefly in the genitive plural termination; further, the *ē*, which, in the Gátha dialect, often replaces the final *ō* of the usual Zend, and which, by the frequency with which writers confound it with *ū*, would also prove itself closely allied to that sound. There is, further, an initial *ā* to be observed, which probably crept into the Zend texts when they were transcribed into their present characters, which, no doubt, are borrowed from the Syriac. This *ā* corresponds to the Aleph prostheticum of the Semitic idioms. Again, the short vowels are always lengthened at the end of a word in the Gátha dialect; owing, most probably to the circumstance that the Gátha literature—the most sacred hymns—were sung, and the singer's voice resting upon the final vowel, whether long

or short, had the effect of lengthening it even in the MSS., written mostly from memory. Of consonants, there are 6 gutturals, 2 palatals, 4 dentals, 3 labials, 4 semivowels, 5 sibilants, 5 nasals. The roots are mostly monosyllabic, consisting occasionally of 1 vowel only, or being a combination of a vowel with a simple or double consonant, or of two consonants with a vowel between them; e. g., *f*, to go; *dā*, to give; *gā*, go; *mera*, to die; *as*, to be; &c. Additional sounds, added to the simple roots, enlarge and otherwise change the meaning of a word—*da*, to make, becomes, by the addition of *th*, *dath*, to place; from *mera*, to die, is derived *merench*, to kill. Three chief modifications are to be noticed in the verbal roots, irrespective of tense and mood—viz., the "causal form," expressing the idea of "to make," "to get made," which is formed by lengthening the vowel of the root, and adding the syllable *aya*, as in Sanscrit. Next stands the desiderative form, expressing the wish of obtaining anything, which is formed by the reduplication of the first syllable, and the addition of *s* to the crude form before the terminations. The last or intensive form, used to render the verb more emphatic, was originally produced by a simple reduplication of the root and the termination; afterwards, only the vowel of the first part was lengthened, and the consonants following were omitted. Three voices—the active, middle or reflective (Lat. deponent), and the passive—obtain in Zend, as in Greek and Sanscrit; and there are four chief moods, which may be used in all these three voices—the indicative, subjunctive, potential, and imperative. The subjunctive is of a double nature, the one expressing the "might, would, or should," and the other the "may"—a feature lost in classical Sanscrit, and only to be met with in the ancient language of the Vedas. The potential, too, is of two kinds, corresponding to the Sanscrit "potential" and "precativ." There are as many tenses in Zend as there are in Sanscrit, though fewer than in Greek, which is, in this respect, the richest of the Aryan stock. There may be distinguished one formation for the present, four for the past, and two for the future.

The general scheme of the (active) present and imperfect is as follows:

PRESENT.		IMPERFECT.	
<i>Active Voice.</i>		<i>Active Voice.</i>	
Sing.	1. mī.	Sing.	1. m.
	2. hī.		2. s, ō.
	3. tī.		3. ī.
Dual.	1. vahi.	Dual.	1. āva.
	2. (lost.)		2. (lost.)
	3. tō, thō.		3. tem.
Plur.	1. mahi.	Plur.	1. mā.
	2. tha, dām.		2. ta.
	3. āhī.		3. en, añ.

The division of the "crude" forms into ten classes, in use with the grammarians of Sanscrit, is also fully applicable to the Zend. Additions and reduplication make up the distinguishing features. The past tenses are likewise formed, as in the sister tongues, by augmentation, reduplication, or composition. Apart from those forms which are identical with those employed in Sanscrit, Greek and Lithuanian, Latin, and the ancient Teutonic languages, we find the use of two kinds of subjunctives. Equal richness of forms is found in the participle and the infinitive, whilst there are fewer gerundial forms than in Sanscrit. Nouns are formed out of roots by the addition of suffixes, which generally correspond to those of the cognate languages. There are three genders in Zend—masculine, feminine, and neuter. The comparative and superlative are formed very nearly as in Sanscrit and Greek. The number of compound nouns in Zend is somewhat less than in the Sanscrit and Greek, on account of its standing nearer the more simple Vedic idiom. There are three numbers and eight cases of inflection for singular and plural of nouns; while there are no less than five cases in the dual, no other Aryan language having retained more than three. The terminations of the cases (in words ending with a consonant) are somewhat according to the following scheme:

	SING.	DUAL.	PLURAL.
Nom.	s.	{a.	ô (as).
Accus.	em.	{a.	ô, as.
Instr.	a.	{bya.	bls.
Dat.	â.	{bya.	byô (hyaç).
Ablat.	at.	{âo.	byô.
Gen.	ô (aç).	{âo.	am.
Locat.	i.	yô.	ašhu, ašhva, hva.
Voc.	—Nom.	..	

There are only pronouns of the first and second persons to be found in Zend, the third being made up by a demonstrative pronoun. There are some older forms to be found in the Gâthâ dialect only. Most of the pronouns resemble closely the Sanscrit forms. The relative is sometimes used as a demonstrative. The numerals from one to ten are: *aēva*, *dva* (*va*, *dugê*, *ayê*), *thri*, *chathware*, *poŭcha* (*muŭd.*), *kshshvas* (*kshshvidem*), *hapta*, *asta*, *nava*, *daga*. The following numbers are formed by the addition of the single cardinal numbers to the ten or *daga*: 20 = *visaiti*, 100 = *gatem*, 200 = *duye gaitê*, 1000 = *hazanra*, 10,000 = *baēvare*, 100,000 = *ahôkheta*. The ordinals are: *paolrya*, first; *bitya*, second; *thritya*, third; *kintâiryah*, fourth; *pakhda*, fifth; &c. "Multiplication numerals" are formed by addition of *keret* and *vat*—e.g., *hakeret*, once; *bishvat*, twice; *thrizvat*, thrice; &c. Particles and prepositions are often identical with those of Sanscrit. The latter may be separated from the verb, if forming part of it, as is the case in the Vedic and Homeric languages, but not in classic Sanscrit or Greek.

We have started with the now fully proved assertion that Zend is closely allied to Sanscrit, more especially to the ancient Vedic dialect. To the latter it bears about the same affinity which the different Greek dialects (Æolic, Doric, Ionic, Attic) bear to one another. The ancient Brahmins and the Parsees are but two tribes of the nation which is called Aryas both in the Veda and Zend-Avesta, the former somewhat to be compared to the Ionians, the latter to the Dorians. But in comparing Zend with Sanscrit, it is noticeable that it resembles more the primitive Vedic than the classical Sanscrit. In verbal forms, chiefly moods and tenses, the classical Sanscrit is much poorer than it is in its primitive Vedic phase, having lost various forms of the subjunctive mood, most tenses of all other moods, except indicative, the manifold forms expressing the infinitive mood, while all these are found completely preserved in the Vedas, Zend-Avesta, and Homeric Greek. From these and many other signs it would indeed follow as if the classical Sanscrit had been formed long after the separation of the Iranians from the Hindus. The differences between the Vedic, Sanscrit, and Zend are very minute in grammar, but important both phonetically and lexicographically, like the difference between German and Dutch. But the philologist can easily transform, by slight phonetic changes, the Zend word into the Sanscrit one. As a striking proof of the original identity of grammatical forms between the two, the circumstance may be cited of their both exhibiting certain identical irregularities.

For *Zend Literature*, we may refer both to our articles on PERSIAN LANGUAGE AND LITERATURE and to ZEND-AVESTA. We confine ourselves here to a brief mention of the principal items. At the head stand the five Gâthas, which may safely be ascribed to Zoroaster and his disciples themselves. There is no doubt that what now survives is but a scanty fragment of what once existed of this literature. Probably they but represent a selection of verses considered most efficacious for putting down evil influences, and for increasing the welfare of the Zoroastrians. The Gâthas, as they now stand, may be compared to the Sâmvêda, which contains selections from the Rîgvêda, used at the Soma sacrifices. Next in order stand the Yasna, or seven chapters, containing songs and prayers, which dates from a much later period; and here again the first portion, or "Younger Yasna," is of still later date; and on the same line stands the Visparad, the collection of prayers called "All Heads," in 23 chapters. The Vendidad, on the other hand, represents conversations held by Zoroaster with Ahuramazda on religious topics, and is most likely the work of the high-priests of the Iranian community of later periods. The Yashts, or songs and conversations, are the latest. The age of the

different works mentioned is fixed by Haug in the following manner: The Gâthas about 900 or 1200 B.C.; the larger portion of the Vendidad at about 900 or 1000 B.C.; the younger Yasna, about 700–800 B.C.; the latest part of the Vendidad (the Fâzend) being written as late as 500 B.C., when the collection of the different parts also seems to have taken place. This computation would give the Zend, or rather the famed Pârsee literature, a range of about 800 years, or from 1200–400 B.C. Cf. Haug's "Essays on the Religion of the Parsees" (Bombay, 1863).—See PERSIAN LANGUAGE AND LITERATURE, ZEND-AVESTA, ZOROASTER.

ZEND-AVESTA, or rather (as the Pehlvi books have it). Avesta-Zend, is the name of the sacred writings of the Parsees (q. v.). The word Avesta (*avastha*) means text, scripture; Zend, or Zand, translation or commentary and paraphrase. According to the last researches in this province, it would seem as if only a small portion of the entire collection now extant were formed by Avesta, or text, the rest being made up of Zend, or commentary, without text. The term Zend has indeed changed its meaning repeatedly. From an authoritative interpretation, emanating from the highest source, in time becoming embodied in the text itself, it came to denote, later, a translation into the native idiom of Persia (the Pehlvi), made by the Zoroastrian priests during the Sassanian period. There is further a special "Zend doctrine" to be noticed, which differs considerably from that contained in the Avesta. A still further explanation of that Zend doctrine is the Fâzend, a word often to be met with in connection with Avesta and Zend. Of this we shall further have occasion to speak.

But before proceeding with an elucidation of the contents and purport of these Zend writings, we must devote a brief space to a sketch of their history, or rather of the different phases the acquaintance with them on the part of the West has undergone. The doctrine of the "Magi," as the ancient world was wont to call the priests of Zoroastrianism, as well as those of India, Persia, and Babylonia, is first alluded to in Jeremlah, where the chief of the Magi is mentioned among Nebuchadnezzar's retainers. In the New Testament (Mat. ii. 1), Magi come to worship Jesus at Bethlehem. The earliest account among Greek writers is furnished by Herodotus, who, on the whole, seems well enough informed for his time. Besides him, we hear of accounts by Ctesias, the Greek physician of Artaxerxes II., by Deion, Theopompus, and Hermippus. But only fragments from their writings have survived, embedded chiefly in Plutarch and Diogenes Laertius. Pliny, Strabo, Pausanias, Dion Chrysostomus further enlarged the stores of knowledge, which, more or less trustworthy, may be gathered from independent sources. Omitting later Greek writers, such as Damascius, Theodorus of Mopsuestia, &c. we turn to Armenian writers of the 6th Christian century. Among them we find Esauk and Elizeus, from whose records we may gather that the Zoroastrians at their time were split into two parties, the one called Mog, the other Zeudik; the former inhabiting chiefly the western parts—Media and Persia principally acknowledging the Avesta; while the latter, living principally in the east (in Bactria), followed the traditional explanations, or Zend proper. To the Arabic writer Masudi (930 A.D.) we owe a comparatively correct account of the sacred book; while Shahrastani (1153 A.D.) is perhaps the first among his countrymen who ranks the Zoroastrians with those other professors of Semitic creeds, the Mohammedans, Jews, and Christians, and not among the idolaters and pagans. In his time, they were already split into many sects, those who believed in the transmigration of souls, like the Brahmins, Buddhists, &c. As a successfully carried out piece of deception, it is to be noticed that Mohammedan writers, for the most part, seem to countenance the fable palmed upon them during the times of persecution by the Magi, that Zoroaster was identical with Abraham—in which there is not one atom of truth. The nations of modern Europe came into contact with the adherents of Zoroastrianism in the western parts of India, and in the 17th c., some MSS. of their sacred books were brought to England. But no one was able to read them; and Hyde himself, the celebrated Oxford scholar, was unable to make any use of them when, in 1700, he wrote his learned work on the Persian Religion. A sort of romantic freak first put Europe into the possession of the key to this book, the language of which had been lost for above a thousand years. A young Frenchman, Anquetil-Duperron, happened to see a few pages that had been copied from a Zend MS. in the Bodleian Library, and he instantly resolved to betake himself to

India in quest of the original Zend writings. To achieve this purpose, he, being without means, had to go as a sailor on board a ship belonging to the French India Company, bound for Bombay, in 1754. The French government, however, stepped in shortly afterwards, and furnished him both with money to purchase MSS., and with a pension, that he might pursue his studies with greater ease. He prevailed upon several of the dasturs, or learned priests, to introduce him into the mysteries of the holy language and rites, and further to sell him some of the most valuable works couched in it. When he considered himself sufficiently competent in Pehlvi and Zend, he commenced a translation of the whole Zend-Avesta in French, in 1759. Two years later, he returned to Europe; and having convinced himself, by a comparison with the Oxford MSS., that those he had acquired of the sacred writings were genuine, he went to Paris, where he deposited his treasures—180 MSS. in different oriental languages; and published ten years after leaving India (1771), the first European translation of the Zend-Avesta, to which was added a great deal of supplementary matter, bearing more or less on the subject. The work created a profound sensation throughout Europe; but, after a while, voices began to be heard by no means so favorable as had been anticipated by the bold and persevering discoverer. Apart from the objections raised against the new book by Immanuel Kant the philosopher, on the score of its not containing any traces of philosophy, a much graver question was ventilated in England—viz., that of its authenticity. It was not that Anquetil was charged with forgery, but the priests, it was said, had found in him a ready dupe. It was principally Sir William Jones, who, in a trenchant letter addressed to Anquetil-Duperron (in French, being, as Sir William Jones said, the only language which Anquetil understood—a little), tried to prove the utter untrustworthiness of the whole work. He was aided therein by Richardson, the Persian lexicographer, who, from four reasons—neither of which, however, is valid—came to the conclusion that the book was a spurious fabrication. While in France there was but one opinion on the subject—viz., that English scholars were trying to run down the work out of sheer spite and jealousy—the opinions of Germany were rather divided. Some, like Meiners and Tychsen, fully acceded to the proofs arrayed against it; but there arose another renowned German scholar, Klenker, who in token of his complete and unreserved trust in the genuineness, set about translating Anquetil's French translation into German, adding several appendices, &c., and principally pointing out the now generally recognised agreement between the more important heads of the doctrines as contained in the book and in the classical writers. Thus matters stood for a long while. In Germany, Anquetil's translation, as rendered by Klenker, became the standard work even for theologians; in England, none any longer thought about it, it having been fully agreed upon by the highest authorities that it was nothing but a clumsy forgery. More than fifty years had elapsed from the appearance of that work, when a Dane, Rask, undertook to look into the matter. Having himself acquired many Zend and Pehlvi MSS. in Bombay for the Copenhagen library, he wrote (1836) a pamphlet, in which he first shewed not only the close affinity between the language of the Zend-Avesta and Sanscrit—which had been pointed out by Erskine and others before—and further proved it to be, not a corruption of Sanscrit, but a distinct language. He also proved that Modern Persian was derived from Zend, as Italian from Latin—a step which at once removed all doubts about the genuineness of the work, and confirming, however, how, to a certain extent, Anquetil, to whom all praise was due for having been the first pioneer, had, through the absence of the requisite philological aids, been occasionally misled in his version in the most woeful manner. The learned dastur himself—with whom Anquetil communicated only in Persian—though well acquainted with the Parsee traditions, and favoring mostly the general sense of the passages, yet possessed no grammatical knowledge whatsoever of the language he pretended to teach. Rask had pointed out the way; Eugene Burnouf followed it. He indeed may be called the founder of Zend philology. For more than twenty years, this eminent scholar devoted all his energies to elucidating, commenting, and discussing this language and the sacred writings couched in it, and in publishing texts and translations. In Germany, Olshausen, Bopp, Müller, Brockhaus, Spiegel, Hang; in Copenhagen, Westergaard, have been busy, ever since in editing and translating either portions of or the entire Zend-Avesta; and though the rediscovery of the language is by no means

an accomplished task, yet, thanks to their indefatigable labors in this field, we are certain that, sooner or later, we shall be in the full possession of all the facts connected with the language and its sacred depository, the Zend-Avesta.

We now address ourselves to the book itself. We know, both from the Parsee traditions and from independent classical witnesses, that the Zend-Avesta was originally of very vast extent, incomparably vaster than the work that now exists under that name. Pliny speaks of 2,000,000 verses composed by Zoroaster; and an Arabic writer, Attavari, mentions the number of 12,000 cowskins (parchments) of which Zoroaster's writings consisted. No doubt these are but round Eastern figures; but it may safely be assumed that the sacred literature in question must once have been of very great extent. The Parsees ascribe its loss to Alexander the Great, but it is more likely that their traditions in that respect refer to the Mohammedan conquests. Yet even then, the greater part of the sacred literature was already lost, and the date of Alexander may in so far be correct, that the Greek ideas that followed in his wake turned the believing minds from the primitive faith, and carried a gradual neglect and loss of the documents in which it was contained, with it. For 500 years from the Macedonian conquest, 335 B.C., to the accession of the Sassanians to the throne of Iran, 225 A.D.—the Zoroastrian religion was not supported by any kings, and decayed in consequence. But when the Sassanians assumed the rule, their principal endeavors were directed to the revival of the ancient faith; and their unceasing researches after the ancient fragments of the Zoroastrian gospel have resulted in the small collection which we now possess. Yet the names and the summaries at least of all or most of the lost portions have survived. The whole scripture is reported to have consisted once of 21 nosks, or parts, each containing Avesta and Zend—that is, text and commentary on it. The number 21 was to correspond to the 21 words of which the most sacred prayer of the Zoroastrians (the Homiovar) was composed. The first of these sections comprised 33 chapters, containing the praise and worship of angels; the second (22 chapters) contained prayers and instructions to men about good actions; the third (22 chapters), an explanation of religious duties and commandments, and the way to avoid hell and acquire paradise; the fourth (22 chapters), knowledge of both this and the future worlds and their inhabitants, revelations concerning heaven, earth, water, trees, fire, men, and beasts, the resurrection of the dead, and the passing of the bridge Chinvat; the sixth (35 chapters) treated of astronomy, geography, astrology; the seventh (22 chapters), of food, lawful and forbidden; the eighth (50 chapters, of which, at the time of Alexander, only 18 were extant) treated of the different heads or chiefs in the creation; and the ninth (in 60 chapters) contained a code of laws for kings, governors, &c.—also a portion about the sin of lying; the tenth (60 chapters) treated of metaphysics, natural philosophy, divinity, &c.; the eleventh (60 chapters) treated of the reign of King Gustasp, and his conversion to the religion, and its propagation by him through the world; &c. Of all the 21 nosks, however, one only, the twentieth (in 22 chapters), called the Vendidad, has survived complete. This treats of the removal of uncleanness of every description from which great evils arise in the world. Some fragments of the other parts only, chiefly the fourth and eleventh, have survived. But there are now in sacred use among the Parsees other books either not included in the foregoing list, or but imperfectly indicated in it. Of the former are the Yazna (Zeshne) and the Visparad (Visporata). To the latter class belong 24 sections called Yashts, and some small prayers of different kinds, such as Afrigao, Nijayish, Gâhe, and Sirozah, or Calendar. Before speaking of these books, we shall say something about their authorship, for which point we further refer to ZOROASTER (q. v.). By the unanimous consent of both classical writers and the Parsees, the whole bulk of the sacred literature is ascribed to Zoroaster himself. They were supposed to be the substance, or, as was held afterwards, the very words of divine revelations from God to the prophet, in the form of conversations. These revelations do not at first appear to have been committed to writing, but to have been orally preserved by his disciples and adherents, and to have been handed down by them to posterity. Surprising as this may seem at the sight of what has remained, as the infinitely larger bulk even of what has perished, it must be borne in mind that, e. g., the Vedas, the Talmud, and the Sunnah have been preserved equally fully in the mouths of many generations. The name Zoroaster or Zaratustra—in

as far as to him is ascribed the authorship of the whole of the sacred writings—is to be taken collectively rather than individually, i. e., as indicating a school of successors and high-priests of the founder, who is designated Zarathustra *Spitamā*; while the chief divines who took his place in after-times were only called Zarathustra. That their decisions and sayings were afterwards “hedged in” with the same reverence as those of the founder himself, need not be argued at length. All that can really be held to emanate from the prophet himself are the five *Gāthas*, which form part of the *Yazna* (Sansk. *yajna*, sacrifice). This *Yazna* consists principally of prayers to be recited at the sacrificial rites—such as the consecration of the *Zōthra*, or holy water; of the *Baregona*, or bundle of twigs of a particular tree; the preparation of the sacred juice of a plant called *homa*—the Indian *Soma* (q. v.) taken to be an emblem of immortality; the offering of certain cakes; &c. The whole of the *Yazna* now comprises 72 chapters, probably corresponding to the (twelve times six) “seasons” during which Ahuramazda created the world. It consists apparently of two parts belonging to different periods. The older is written in what Haug calls the *Gāthā* dialect (see *ZEND*), and was considered sacred even at the time when the other books of the *Zend-Avesta* were composed. This “older *Yazna*” was divided again into the *Gāthas* and some minor pieces. The former, five in number, are small collections of (metrical) sacred prayers, songs, and hymns, exhibiting philosophical and abstract thoughts about metaphysical subjects. The name itself signifies “song.” Their metre resembles chiefly that of Vedic hymns. They are without rhymes, and only the syllables are counted. The first bears the heading (which is also intended for the other four), “The Revealed Thought, the Revealed Word, the Revealed Deed of Zarathustra the Holy; the Archangel’s first sang the *Gāthas*.” They are all more or less devoted to exhortations on the part of the prophet to forsake polytheism (the *devas*, or gods), and to bow only before Ahuramazda. The difference between monotheism and idolatry is pointed out in the respective sources whence they flow—viz., “existence” and “non-existence.” The mission, activity, and teaching of Zoroaster are dwelt upon more or less in all *Gāthas*, but chiefly in the second. To the other portion belongs further the “*Yazna* of seven chapters,” which seems to have been composed by early disciples, and which consists of prayers in prose, addressed to Ahuramazda, the angels, the fire, the earth, the waters, and other spiritual beings—genii presiding over the different parts of the good creation; further, over devotion, speech, &c. There is further a chapter containing a formula by which the ancient Iranians were received into the new religious community. The so-called younger *Yazna*, written in the common *Zend* language, is of more varied contents, such as, an invitation to Ahuramazda and all the good spirits to be present at the sacrifice; further, pieces referring to the preparation and drinking of the *homa* juice; next, the praises of the genius *Serosh*, and a commentary on the most sacred prayers. The *Visparad*, which forms the next most important part of the *Zend-Avesta*, contains a collection of prayers, composed of 23 chapters, written in *Zend* (not *Gāthā*), and resembling the younger *Yazna*. They refer to the same ceremonies—the preparation of the sacred water, consecration of certain offerings, &c. Next are to be considered the *Yashts*, in 24 divisions. *Yasht* (*yésti*) means worship by prayers and sacrifices, and in the *Avesta* indicates certain laudations of sacred persons and objects—*yzatas* (*izad*)=angels; and in so far different in nature from the invocations in the *Yazna* and *Visparad*, that, while in the later the divine beings are invited promiscuously, the single *Yashts* are addressed to individual numina, such as the archangels, the sun, the heavenly water, the star *Tisfrya*, &c. In these songs—the work of Median bards, probably—are also found the primary sources of the legends contained in the *Shāh-nāmah* (q. v.). Before speaking of the *Vendidad*, the “Pentateuch” of the Zoroastrian “canon,” we shall yet briefly mention some smaller pieces, which are now used as common prayers by the Parsees, such as the five *Niyāyish*, or praises, addressed to the sun, the moon, the water, and the fire; the *Afrīgāna*, or blessings to be recited over a certain meal prepared for an angel or a deceased person; the five *Gāhs*, or prayers to the angels set over the five different times of the day and night; and finally, the *Sirozah*, or thirty days, being a calendar, or rather an enumeration of the thirty divine beings that preside over each of the days. It is chiefly recited on the thirtieth day after the death of a man. The *Vendidad*, to which we now turn, is the code of religious, civil, and criminal

Zengg
Zeolite

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laws of the ancient Iranians. It consists of 93 chapters or *fargards* = sections. It seems to have survived in a fragmentary state only, and is evidently the work of many hands and many centuries. It appears as if, starting from old sayings in the Avesta, the Iranian high-priests in various periods had interpreted them often at variance with each other: these their interpretations (*Zend*) were made the theme of further interpretations (*Pâzend*), and the three phases of interpretation were received in the course of time as equally authoritative among the faithful. There are three parts to be distinguished in the *Vendidad*. The first is introductory, containing an enumeration of 16 Aryan countries over which the Zoroastrian religion was spread; further, legends of King Yurta, and recommendations of agriculture. The second part (chaps. 4-17) forms, as it were, the groundwork of the *Vendidad*, treating of laws, ceremonies, and observances. The third part is a kind of appendix, treating of various subjects, chiefly of a medical kind, such as spells against diseases, &c. Here also ought to be mentioned the *Bundehesh*, written entirely in Pehlvi, which seems a compilation of several extracts and fragments of partly ancient, partly recent Zoroastrian writings, forming a sort of compendium or dogmatic handbook of Zoroastrianism. For an account of the latter, we refer to *GUERRAS, PARSEES, and ZOROASTER*.—Burnouf, "*Vendidad Sade*;" Ohlshausen, "*Vendidad Zend Avesta*;"—French translation by Anquetil-Duperron, German by Klenker; Spiegel (the German text, with Spiegel's commentary, re-translated into English by Bleek; Rask, "*Alter und Echtheit der Zendsprache*;" Haug, "*Essays*;" &c.

ZENGG, Senj, or Segula, an important free port of the Austrian empire, in Croatia, lies on the Adriatic, 71 miles south-east of Trieste, at the termination of the Josephine Road, opposite the island of Veglia. Z. is the see of a Roman Catholic bishop, has a tolerably large and elegant cathedral, an upper gymnasium, a seminary for priests, an academy, and school of navigation; a small harbor (free), somewhat unsafe; and some trade in grain, honey, wax, wine, salt, tobacco, wood, fish, and cattle. Pop. (1869) 8496.

ZEN'ITH, a word like *Nadîr* (q. v.), borrowed from the Arabic, is the name given to that point of the heavens which is directly overhead, i. e., in line with the spectator's position and the centre of the earth. It is thus the upper pole of the spectator's horizon, as the *undir* is the under pole. The word would seem to be connected with the Arabic *san*, a "point."

ZENJA'N, a populous and thriving town of Persia, in the province of Irak-Ajemi, about 170 miles north-west of Teheran, and 70 miles south-south-west of the Caspian Sea, on the table-land of Azerbaijan, at the junction of the roads from Hamadan and Teheran to Tabriz, on a tributary of the Kizil-Oksen, which flows into the Caspian. It is surrounded by orchards, has old walls, a palace, a mosque, bazaars, and a trade in carpets, woollen cloths, arms, lead, and gunpowder. Pop. estimated at 15,000.

ZENO, a philosopher of Elea, a town of Lucania, in Italy, was a favorite disciple of Parmenides. He visited Athens, and the illustrious Pericles was one of his pupils. According to the account usually given, on his return to Elea, he joined a conspiracy to deliver his native town from the tyrant Nearchus, and on the failure of his plot, was captured, and put to the torture. On being interrogated as to his accomplices, he named the principal courtiers, and is said to have bit his tongue off, and spat it in the tyrant's face. However, the historical evidence for this account is unsatisfactory; and whether Z. perished in his attempt or survived the tyrant, is uncertain. He held the usual doctrines of the Eleatic school respecting the unity and the immutability of all things, distrust in knowledge acquired through the senses, and reliance on pure reason. He did not deny that there were phenomena or appearances, but he maintained that these were not real existences. In this he anticipated the Berkeleyan theory. But he is chiefly remarkable for having been the first to employ the style of argument known by the name of *Dialectics*, in which error is refuted, and truth sought to be established, by the *reductio ad absurdum*—a method so skillfully employed afterwards by Socrates and Plato. He devoted his great powers of augmentation to enforce the doctrines

first broached by Xenophanes, and more systematically developed by Parmenides. His works were in prose, but only small fragments have been preserved.

ZENO, founder of the Stoic philosophy, was born at Citium, in Cyprus. The dates of his birth and death are uncertain. He flourished in the early part of the 4th c. B.C., and was a contemporary of Epicurus. His father was a merchant, and on his trading voyages brought home with him from Athens some writings of the Socratic school. By these, Z. is said to have been attracted to the study of philosophy. At the age of 30, he was shipwrecked off the coast of Athens, and having lost his property, he willingly adopted the Cynic doctrines, in which contempt for riches is conspicuously taught. He attached himself first to Crates, but soon became dissatisfied with the coarse, ostentatious disregard for established usages, and the indifference to speculative inquiry, which characterise the Cynic sect. He next joined the school of the Megaric Stilpo, and there became a proficient in the art of disputation. Still unsatisfied, he betook himself to Polemo the Academician. Having thus made himself master of the tenets of the various schools, he proceeded to open a school for himself, wherein he might shew forth the result of all his inquiry, and develop his own peculiar system. See STOICS. He selected for the purpose the "Painted Porch" (*Stoa Poikile*), from which his sect has got its name, and there, till his 98th year, as is said, continued to teach those doctrines, which, in spite of serious drawbacks, inculcate that manly energy and simplicity, fortitude under suffering, and reverence for moral worth, which made disciples of so many of the noblest characters among the Romans. As a man, Z. deserved and gained the highest respect. The Athenians honored him with a gold crown and a public burial, and his countrymen erected a monumental pillar to his honor. Of his numerous writings, scarcely any thing remains save the titles.

ZENO'BIA, queen of Palmyra, succeeded (267 A.D.) her husband Odenatus, who had been acknowledged by Gallienus as his colleague in the Roman Empire. Nearly the whole of the eastern provinces submitted to her sway. When Aurelian assumed the purple, he marched against her with a large army, and after defeating her in several battles, besieged her in Palmyra. Her hopes of being relieved by the Persians and Arabians being disappointed, she attempted to escape by flight, but was captured, 273 A.D. Before the conqueror, her courage failed, and she saved her own life by imputing the blame of war to her counsellors, especially the celebrated Longinus, who was accordingly put to death. Z. was led in triumphal procession at Rome, decked with splendid jewels, and almost fainting under the weight of gold chains. She was presented by her conqueror with large possessions near Tivoli, where in the society of her two sons, Heronulianus and Timolaus, she passed the rest of her life in comfort and even splendor. She was a woman of great courage, high spirit, and strikingly beautiful. With purity of morals in private life, she combined prudence, justice and liberality in her administration. Her literary acquirements were considerable; she spoke Latin and Greek, as well as the oriental languages, with fluency. The balance of authority is said to be in favor of the belief that she was attached to the Jewish faith.

ZENTA, or Szenta, a town of Hungary, in the county of Bacs, on the right bank near the Theiss, 120 miles south-south-east of Pesth, in a beautiful plain. Cattle-breeding is carried on. Pop. (1869) 19,933. It is celebrated for the victory of Prince Eugene over the Turks in 1696.

ZEOLITE (Gr. *zeo*, to boil), the common name of a large group of mineral, often called the Zeolitic family. They receive this name from their melting before the blowpipe. They are all soluble in acids, and most of them gelatinise in acids in consequence of silica being set free. They are hydrated silicates of alkalies or alkaline earths, most of them containing alumina. Magnesia is rarely present in them. Their composition, however, is very various. They are generally found in amygdaloidal cavities, or in fissures of trap and other Plutonic rocks, as granite and gneiss, apparently as deposits from water percolating through the rock. They sometimes, but rarely, occur in veins. They are found either in crystals or of crystalline structure, often in plates or fine scales, often in needles or fibrous. Among them are *Analcime*, *Natrolite* or *Mesotype*, *Scolerite* or *Needlestone* (*Needle*

Zephaniah
Zenxis

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Zoolite, *Stilbite*, *Houlandite*, *Brewsterite*, *Apophyllite*, *Chabasite*, *Harmotome* or *Cross-stone*, and *Laumonite*. The number of species and varieties which have been described and have received distinct names, is very large.

ZEPHANI'AH (the name probably signifies a "watcher of the Lord"), a Hebrew prophet who flourished during the reign of Josiah, in the latter part of the 7th c. a.c. The subject-matter of his brief "prophecy" is the temporary desolation of Judæa ("I will utterly consume all things from off the land," i. 2), on account of the infidelity and worldliness of the inhabitants, Jerusalem being specially assailed by the author for her filth and pollution; the tyranny and rapacity of her rulers, and the violence and treachery of her priests and prophets. At the same time the prophet predicts the destruction of the surrounding heathen nations, the Philistines, the Moabites, Ammonites, Ethiopia, and Assyria. The close, in which he declares that God will leave a righteous remnant in Israel, and for their sakes will ultimately bless the land with permanent peace, is couched in a strain of tender exaltation.

ZERBST, capital of the former duchy of Anhalt-Zerbst (See **ANHALT**), a town of North Germany, in the duchy of Anhalt, 10 miles north-west of the town of Dessau, and 63 south-west of Berlin, is situated on a level sandy spot on the river Nuthe, a tributary of the Elbe. In place of the ancient walls, promenades now encircle the town. Close by is a beautiful large palace, the ducal residence. The town has four Protestant churches, a Roman Catholic one, and a synagogue. The church of St Nicholas is a beautiful specimen of Gothic architecture. The town is the seat of a court of justice; has a high school, called Franciscum; female, Industrial, and other schools; a house of correction, and orphan asylum, hospitals, and a work-house. The chief manufactures are articles in gold and silver, silk, wax, soap, stone-ware, carriages. There are many breweries, whose produce is exported in large quantities. The vegetable products are considerable, and the culture of hops is carried on. Handsome baths have been erected over a mineral spring recently discovered here. Pop. (1871) 11,995.

ZEULENRO'DA, a town of the German empire, in the little principality of Rhenus-Greiz, 10 miles west of the town of Greiz, and 51 south-south-west of Leipzig, stands on a high plateau, in a wooded hilly district. Z. has suffered severely at various times from conflagrations, and is now regularly built, consisting of a handsome town and four suburbs. It has a spacious market-place with a beautiful court-house, two churches, a bazaar and free school, and a hospital. Besides some bleach-works and a trade in cattle, there are manufactures of woollen goods, especially hosiery, the fineness of which is famous. Pop. (1875) 6300.

ZEUS (Sanc. *dis*, light, *dæus*, heaven, *devas*, god; Lat. *Ju-piter*, and *Dis-piter*, i. e., Father Zens; Ang.-Sax. *Tiu*, whence Tuesday) was the greatest of the national deities of Greece. According to the most received mythology, he was the son of Cronos and Rhea, brother of Poseidon and Hera, the latter of whom was also his wife. He expelled his father and the older dynasty of the Titans; assumed the sovereignty of the world, and successfully resisted the attacks of the giants and the conspiracies of the gods. In the allotment of the world, after the dethronement of the Titans, Z. gained the rule of heaven and air, Hades of the infernal regions, and Poseidon of the sea; while the earth was left subject to the influence of all three, though Z. was regarded as having the supremacy throughout all departments. Crete, Dodono, and Arcadia were the places where the worship of Z. was most cultivated; and although originally the inhabitants of these places may not have looked upon themselves as worshippers of the same god, yet, in process of time, all the local gods revered under the name of Z. were at last merged in one great Hellenic divinity; a process which was carried still further out when he was identified with the Jupiter of the Romans and the Ammon of Libya.

Besides the epithets of Z. from the seats of his worship, he had many titles applied to him from his various powers and functions, moral and physical. He was the father and king of gods and men; the protector of kings, of law and order; the avenger of broken oaths and of other offences; he watched over the state, the assembly, the family, over strangers and suppliants; his hand wielded the lightnings and guided the stars; he ordained the changes of the seasons, and, in short, regulated

the whole course of nature. All prophecy, too, was supposed to originate in him, and it was from him the prophetic god Phœbus received his oracular gift. He dispensed, as it pleased him, both weal and woe to mortals; but whether he could control the Fates themselves, is a point about which the ancients disagreed, as men have done in all ages where the question of free-will and fate is concerned. Of the many epithets applied to Z., perhaps, the best known is the Olympian, from that Olympus in Thessaly whose summit was believed to be his residence as well as that of the other gods. His most celebrated festival was the Olympic, held at Olympia, in Elis, after the end of every fourth year.

Combined with such exalted conceptions of the majesty and power of Z., we find, many stories current respecting his amours with mortals and immortals; he is represented as acting with caprice, anger, deceit. Probably, in many cases, an ancient Greek of average position and capacity did not view such matters with any very strong feeling of disapprobation. Others, again, as Xenophanes (q. v.), protested against the transference to the gods of human passions and fallings; or, as Pindar, maintained that they would believe nothing of the gods that was discreditable to them; or, as Euripides, argued that such tales were sufficient to disprove their divinity; or, as Euhemerus, held that the local worship of Z., like that of other deities, was owing to the fact, that divine honors were paid to deified men at the place of their burial, and that of course it was no wonder to find human actions assigned to gods who had once been human. In modern times, the various myths were at one time explained as symbolical of various celestial and terrestrial phenomena, such as the apparent motion of the sun, the alternation of day and night, the changes of the seasons, and so forth. The most rational explanation is as follows: In early times, men thought and spoke of natural objects as if they were personal agents, employing names for them which were literally, not symbolically significant. But from lapse of time, and the departure of various tribes from their original seats, in many countries the meaning of these words became obscured, and though men still used them, their real significance was forgotten, and terms which originally had expressed some process of nature, were conceived to narrate some incident in the history of a person. For example, the expression that the sun follows the dawn, was misunderstood, and gave rise to the myth of Phœbus pursuing the nymph Daphne, because the word Daphne was no longer understood. Such misconceptions were then, by successive ages, elaborated into myths, more or less fanciful, and even revolting. In this respect, Z. has fared no better, or rather much worse, than the other deities. In the same way as the Greek war-god Ares is a personage much inferior to the Latin Mars, so the serious and unimaginative Roman's conception of his majestic Jupiter Optimus Maximus (the best and greatest), was more elevated than that conceived of Z. by the sensuous Greek, but this might be expected from the different character of the two peoples. Except in the grander attributes of omnipotence and fatherly care of the universe, we can trace little in common; for the Jupiter of the Latin poets, as portrayed in Virgil and Ovid is drawn entirely from Greek sources, and is merely the Z. of Greek mythology with an altered name.

ZEUXIS, the celebrated painter, was born at Heraclea, probably the city of that name in Lucania. He is also styled of Ephesus, which means that he belonged to the Ionian school of painters. He flourished in the latter part of the 5th c. B.C., and was at Athens about the beginning of the Peloponnesian war. He excelled in the treatment of light and shade, in accuracy of imitation of natural objects, and in expressing the perfection of human, and particularly female beauty. This last he effected by selecting the finest models he could find for each separate part. His most famous pictures were "Zeus enthroned, with the Gods standing round;" "Helen;" "The Infant Hercules strangling the Serpents;" "The Female Hippocentaur." By the exercise of his art, he attained to great riches and fame, and like his rival Parrhasius, was exceedingly conscious of his pre-eminence. He repeatedly presented rather than sold pictures to cities that were anxious to possess them, because he thought no money-price could pay for them. Greece was plundered of many of his masterpieces by her Roman conquerors; and one of the noblest, the "Hippocentaur," was lost on the passage to Rome. Designs on vases, sarcophagi, and other works of antiquity exist

ZEYST
Zimmerman

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adorned with representations of the same subjects as Z. painted, and probably were imitated from his productions.

ZEYST, a large village in the Netherlands, province of Utrecht, is surrounded by beautiful well-wooded estates and country-seats, the summer residences of many of the first families of Amsterdam. The industries are making soap, candles, and vinegar, brass and zinc founding, &c. On a rising ground, and surrounded by fine old trees, stands the Dutch Reformed church, built in 1180. There is also a Roman Catholic church. In 1746, a society of Moravian Brethren settled at Z., where they have built a separate quarter, consisting of public and private buildings, erected along the sides of two large grassy squares, called the Easter Plain and the Wester. Besides the church, there is an excellent day and boarding-school, which is resorted to by children of parents belonging to various Protestant communions. The unmarried members live, the males in the Brothers' House, the females in the Sisters' House. Another building is set apart for widows. There are also family residences, workshops, and warehouses. In 1870, the pop. of Z. numbered 5440; in 1875, 5547.

ZIERIKZEE, an old and important town in the Netherlands, province of Zeeland, is situated in the south-east of the island of Schouwen. It was fortified before the beginning of the 11th c., and owed its rise and prosperity to the shipping trade and fishing. The walls have been levelled, planted with trees, and formed into shady walks. Z. has two havens, the old and the new, two Dutch Reformed churches, a Lutheran, a Roman Catholic, a small dissenting church, and a Jewish synagogue. There are a grammar-school, school of design, and other excellent public schools maintained by the town. The principal means of living are trade in agricultural produce, shipping, ship-building, fishing, weaving calicoes, beer-brewing drying madder, sawing wood, grinding corn, &c.

Z. suffered severely in the contests between Flanders and Holland for the possession of Zeeland. In 1808, the Flemings besieged it with a large army, but were compelled, by Count William of Holland, to retire, on the 10th of August 1804. In the long war of independence, after an obstinate defence, the Spaniards took Z. on the 2d of July 1576. Pop. (1870) 7834; in 1875, 8048.

ZIGZAG, in Military Science, a trench of approach against a fortress; so constructed that the line of trench may not be enfiladed by the defenders. See **SIEGE**.

ZIGZAG, a decoration characteristic of the Norman style of architecture. It consists of one or more mouldings running in zigzag lines, and is used with great effect. The zigzags are employed in great profusion, and are sometimes undercut so as to be detached from the mouldings.

ZİLLEH (ancient *Zela*), a town in Asiatic Turkey, in the pashalic of Sivas, about 30 miles west-south-west of Tokat. It is built on a height, with a small flat conical hill in the centre of the town, which is evidently the mound or road, of which another portion is still seen at Thyana, the construction of which was attributed to Semiramis. Scarcely any remains of antiquity are to be found here; an angry fortress of the middle ages having usurped the place of its beautiful temple. This was the field of Julius Cæsar's battle with Pharnaces, of which he wrote "*Veni, vidi, vici*." There are several large khans, and manufactures of coarse cottons. Its annual fair, of 15 or 20 days, from the middle of November, is often frequented by 40,000 or 50,000 persons from the commercial towns of Asiatic Turkey. There are about 2000 houses, the population being almost entirely Turkish.

ZİLLERTHAL, one of the principal valleys in the Tyrol, traversed by the Ziller, is about 50 miles long. Towards the south and south-west, it is bounded by lofty glaciers; but towards the north, where it opens into the valley of the Inn, it is tolerably fertile. Among the eight secondary valleys are the Duxerthal—famous for its precipitous glaciers, 1200 feet high—and the Zemthal, both remarkable for several great waterfalls. The inhabitants of the Z., who number about 14,000, are celebrated even in the Tyrol for their handsome, well-built figures; and their fine Alpine songs are well known and appreciated in London and Paris. The chief wealth of the Z. is derived from the rearing of cattle. About 5000 head of cattle are exported yearly; but, notwithstanding, the valley is not able to support its numerous population.

Many of the men hire themselves out as servants for the summer, while others go about as pedlars, selling essences of herbs, and gloves, of which 10,000 pair are made yearly. The principal town is Zell. For some years, the valley has been much visited by artists, chiefly from Munich.

In recent times, the inhabitants of Z. acquired considerable notoriety by a part of them leaving the Roman Catholic Church, and emigrating. For a considerable time, they had been in the habit of reading the Bible, and were on friendly terms with the Protestant Church, although still attending the Roman Catholic service; but when, in 1830, the Catholic clergy began to enforce an arduous confession with greater strictness, a number of them thought seriously of going over to the Protestant Church. Ere long, they not only objected to the confessional, but to the worship of the saints, absolutions, masses for the soul, purgatory, &c. In 1830 they began to leave the church; and by 1832, the number of dissenters had amounted to 340. The Emperor Francis, to whom, on his visit to Innsbruck in 1832, they addressed a petition regarding their religion, promised them toleration; but after considerable delay, they were told (1834) that they must either return to the Catholic faith or remove to Transylvania, where there were Protestant congregations. As the Zillerthalers could not agree to this, they formed the resolution, as the Protestants of Salzburg had once done, of seeking a refuge in Prussia. This was granted; and the Zillerthalers, who had been allowed by the Austrian government to sell their property, set out, August 1837, for Prussia. In all, 899 men, women, and children arrived, 2d October, at Schmiedeberg, in Silesia, where they were to stay until the arrangements for their reception in Ermannsdorf were completed. The king gave them 22,500 thalers (23375) on their settlement, and (1839) made them a further grant of 12,500 thalers (£1875) for a church and school. The colony received the name of Z., and in 1871 numbered over 400 inhabitants.—See “Geschichte der Zillerthaler Protestanten” (Nürnberg, 1838); Rheinwald, “Die Evangelischgesinnten in Zillerthal” (4 Aufl., Berl. 1838).

ZIMB, a dipterous insect, exceedingly destructive to cattle in Abyssinia, as the Tactse (q. v.) is in more southern parts of Africa. It probably belongs to the same family, but this has not yet been ascertained. It is supposed to be the *Zebub* of the Hebrew Scriptures (Is. vii. 18). Bruce describes it as very little larger than a bee, but thicker in proportion; the wings broader, and without color or spot; the head large; the upper lip sharp, having at the end of it a strong pointed hair, a quarter of an inch long; the lower lip with two similar bristles. The flight of the insect resembles that of the gnat, and is attended with a peculiar buzzing. The Z. is found only where the soil consists of a rich black loam; but all the inhabitants of the seacoast, along the southern shores of the Red Sea, and southwards beyond Cape Guardafui, are compelled to remove their cattle in the rainy season to the nearest sands, in order to prevent their destruction by this pest, as well as those of more inland districts from the mountains of Abyssinia northwards to the confluence of the Astabornas and the Nile. “As soon as the plague appears, and their buzzing is heard,” Bruce says, “all the cattle forsake their food, and run wildly about the plain till they die, worn out with fatigue, fright, and hunger.” The camel, the elephant, and the rhinoceros are liable to the attacks of the Z., as well as the ox; but the elephant and rhinoceros protect themselves by rolling in mud, which, when dry, coats them as a kind of armor.

ZIMMERMAN, Johann Georg, a native of the town of Brugg, in the Swiss canton of Bern, in which his father was a senator, was born on the 8th December 1738. He was educated at home, in the first instance, and afterwards at Bern, preparatory to his going to the university of Göttingen to study medicine. This he did in the year 1747. By his countryman, the celebrated Haller, he was kindly welcomed; he became an inmate of his house, and had the advantage of his valuable aid in the prosecution of his studies. In these he displayed the utmost ardor, not content to confine himself to medicine, but aiming at a large and liberal culture. In his specialty, so great was the proficiency attained, that on his taking his degree of Doctor in 1751, he published a work entitled “Dissertatio Physiologica de Irritabilitate,” which not only at the time attracted attention by its originality of view, but even now is held to be not without value. In 1752, he began to practice as a physician at Bern with every prospect of success; but shortly after, the poet of pub-

the physician falling vacant in Brugg, his native place, he was induced to transfer himself thither. About this time, he was married to a relation of his friend and preceptor, Haller. Despite the extensive practice he speedily acquired, with such a reputation for skill as brought patients from a great distance to consult him, he continued to cultivate other pursuits; and in 1756, he published a miscellany of prose and verse, remarkable as containing the first sketch of his treatise "On Solitude," which afterwards became so famous. In 1758 appeared his work on "National Pride," an ingenious and able dissertation, which immediately became popular, and carried the name of the writer, by translation, into nearly every country in Europe. That he did not, however, neglect his special department of study was proved in 1763 by the appearance of an elaborate work on Experience in Medicine ("Von der Erfahrung in der Arzneikunst;" Zürich, 2 vols. 8vo). Of this, the great value was instantly recognised, and it still continues to enjoy some portion of its first reputation. Z. was now a man of European note; and among other advantageous offers made to him was that of the post of Physician to the king of Britain at Hanover, with the title of Aulic Councillor attached to it. This he accepted; and to Hanover he accordingly went in 1768. His repute as a physician continued here to increase, and from all quarters came flocks of people to have the benefit of his advice. In 1770 he had the misfortune to lose his wife; and this distress was complicated by an attack of an internal malady, which soon after obliged him to go to Berlin to undergo a perilous operation. This was successfully performed, but did not preclude a return of the complaint some time after. His only daughter now died; and a son who survived sunk under the influence of disease into something like entire idiocy. Z., who had almost from his very boyhood had to struggle against a constitutional melancholy, became now, as it almost seemed, a confirmed and hopeless hypochondriac. From this deplorable state he was rescued for a time by a second marriage into which his friends persuaded him; and as fruit of his revived interests in life he gave to the world in 1784, his celebrated work *On Solitude* ("Ueber die Einsamkeit;" Leipzig, 4 vols. 8vo), a book which speedily became a popular favorite throughout Europe. In 1786, he was invited by Frederick the Great, then in his last illness, to attend him at Potsdam. On going thither, he found that the case of the king was beyond the reach of his art. He remained, however, for some time; and as the result of his sojourn, he published in 1788 and 1770, two works on Frederick the Great, the manifold indiscretions contained in which involved him in much painful and acrimonious controversy. In excuse of much in the books not easily to be defended, everything seems to show that they were merely the first indications of a return of his constitutional malady in an aggravated, and, as it proved, a finally intractable and hopeless form. His melancholy hallucinations continued to grow upon him, till he was at length little better than a mere maniac; and on the 7th of October 1795, he died at Hanover. During these last sad years, he had continued at intervals to write and publish; but in everything thus produced there was evident the wreck of his once brilliant faculties. As a physician, a philosopher, a man of general accomplishment, and a writer of singular power and felicity, Z. was unquestionably one of the most remarkable figures of his time. Of Zimmerman on "Solitude" every one must needs have heard: it no longer retains the immense popularity it once had; but along with his more expressly medical treatises, which are of interest—if not very much now otherwise—in relation to the history and development of his profession, it must still continue for a time to perpetuate the name of its writer.—See "Z.'s Eigene Lebensbeschreibung" (Autobiography, Han. 1791); Tissot, "Vie de Z." (Lausanne, 1797); Wichmann, "Z.'s Krankengeschichte" (Hau. 1796).

ZINC (Zn, eq. 32.5—new system, 65—sp. gr. 6.8), or *Spelter*, as it is often called in commerce, is a hard bluish-white metal, lustrous externally, and when broken, exhibits a foliaceous crystalline fracture. At ordinary temperatures, it is somewhat brittle; but when heated to above 212°, it becomes perfectly ductile and malleable, and may be drawn out into wire or beaten into thin plates. At about 400°, it again becomes so brittle that it may be easily pulverised. It fuses at 773°, and at a white heat may be volatilised; and if the vapor be exposed to the air, it burns very brilliantly, and is converted into oxide of zinc, which is deposited in copious white flakes. The temperature of its boiling-point is estimated by Beville at 1904°. On exposure to the air, zinc soon loses its metallic lustre, and assumes a gray appear-

ance, in consequence of its surface becoming oxidised, while the metal beneath is thus protected from further change—a property which renders this metal especially useful for many economical purposes. It has no action on water at ordinary temperatures, but if a mineral acid be present, it readily decomposes water, and is employed to decompose the water of dilute sulphuric acid, when hydrogen is required. Moreover, a hot solution of potash acts on zinc, hydrogen being liberated, while oxide of zinc is formed and dissolved in the alkaline solution. Zinc precipitates from their solutions most of the electro-positive or basyious metals less oxidisable than itself.

This metal is never found in the native state; the chief ores from which it is extracted are noticed below.

The commercial zinc obtained by the ordinary methods of extraction usually contains a small quantity of lead, iron, and carbon, with occasional traces of arsenic and copper. In order to obtain it in a chemically pure state, a stream of sulphuretted hydrogen is passed through a slightly acidulated solution of sulphate of zinc, and after the removal of any precipitate that may be found, the solution is boiled so as to expel the gas, after which the zinc is precipitated in the form of carbonate, by the addition of carbonate of soda. The carbonate is converted by ignition into oxide of zinc, which must be distilled in a porcelain retort with the purest available form of carbon, as, for example, charcoal prepared from loaf sugar.

Zinc is commonly regarded as forming only one compound with oxygen—namely, the *protoxide of zinc* (ZnO), although it has been suggested that the film which is formed upon the surface of metallic zinc by exposure is a sub-oxide. Protoxide of zinc is obtained by heating the metal in the air, the white oxide thus obtained being formerly known as *Lana philosophica*, from its woolly appearance; while it was known as *Flores zinci*, or *Flowers of Zinc*, in pharmacy. The process of manufacturing this oxide, when it is required as a pigment, consists, as Professor Miller remarks, “in distilling zinc from clay retorts into chambers through which a current of air is maintained. The volatilised metal burns at the high temperature to which it is exposed under these circumstances; and the oxide is deposited in a series of condensing chambers.”—“*Inorganic Chemistry*,” 8d ed. p. 546. The pigment thus obtained is known as *Zinc White*. The impure oxide of zinc, commonly known as *Tutty*, is obtained from the fumes of furnaces in which brass is melted. A hydrated oxide of zinc (Zn_2HO) is precipitated in a white gelatinous mass from the solution of the salts of zinc by the addition of potash or soda, but redissolves in an excess of the alkali. Oxide of zinc is readily soluble in acids, and is capable of being reduced by charcoal, but not by hydrogen. The most important salts formed by oxide of zinc are the sulphate and carbonate. *Sulphate of Zinc*, or *White Vitriol* ($\text{ZnO} \cdot \text{SO}_3 + 7\text{Aq}$), occurs in large transparent, glistering, four-sided prismatic crystals, resembling those of Epsom salts. At a temperature a little below 212° , the crystals lose six equivalents of their water of crystallisation, and at a somewhat greater heat, they lose their last equivalent, and previously to losing their water of crystallisation, they fuse in it. This salt is readily soluble in water, requiring $2\frac{1}{2}$ parts of the latter for its solution at 60° . It is obtained in considerable quantity as a residue in the process of obtaining hydrogen from dilute sulphuric acid and zinc; and it is prepared on the large scale by roasting and lixiviating zinc-blende or sulphide of zinc, which, when heated in the presence of air, is oxidised into the sulphate. *Carbonate of Zinc* ($\text{ZnO} \cdot \text{CO}_2$), constitutes one of the most important of the zinc-ores—viz., the common or rhomboidal variety of *calamine*, a name which is derived from the property which this substance possesses of adhering after fusion in the form of reeds to the base of the furnace. Carbonate of zinc may be artificially prepared by precipitating a salt of oxide of zinc with carbonate of soda, when the required salt falls as a white precipitate; this is, however, not simple neutral carbonate, but a basic carbonate, having the composition expressed by the formula $2(\text{ZnO} \cdot \text{CO}_2) \cdot 3(\text{ZnO} \cdot \text{HO})$. Of the haloid salts, the *Chloride of Zinc* (ZnCl), formerly known as *Butter of Zinc*, is the only one requiring notice. This salt is obtained in the anhydrous form by burning zinc in chlorine gas, and in the hydrated state by dissolving zinc in hydrochloric acid, and evaporating the solution, chloride of zinc being thus formed, while hydrogen escapes in the gaseous form. In the anhydrous state, it forms a whitish-gray, semi-transparent mass, which fuses

readily, and sublimes at a high temperature. When exposed to the air, it soon deliquesces, and is soluble in water in all proportions. The watery solution has a burning and nauseous taste, and in a concentrated state acts as a powerful caustic. It may be crystallised with 1 equivalent of water from its aqueous solution; and it is soluble in alcohol. It forms double salts with the chlorides of sodium, potassium, and ammonium; and a concentrated solution of the double chloride of zinc and ammonium ($\text{H}_2\text{NCl} + \text{ZnCl}_2$) is much used for the purpose of removing the film of oxide from the surface of metals, such as zinc, iron, or copper, which are to be suited by the operation of soldering."—Miller's "Inorganic Chemistry," 8d ed. p. 546. With sulphur, zinc forms only one combination—viz., *sulphide of zinc*, or *blende* (ZnS), which is one of the most abundant of the zinc minerals. Blende, when pure, is of a pale brown color, but it is commonly blackish from admixture with sulphide of iron. It usually occurs crystallised in rhombic dodecahedra, or allied forms, but sometimes is found in the massive state. Sulphide of zinc may be obtained artificially as a white precipitate, which, on drying, becomes yellow, by the addition of sulphide of ammonium to a solution of a zinc-salt. Zinc forms several important alloys, amongst which *brass* (consisting of 2 parts of copper to 1 of zinc) and *German Silver* (q. v.) may be specially noticed. Professor Miller sums up the characters of the salts of zinc as follows: "The salts of zinc are colorless; their solutions have an astringent, metallic taste, and act rapidly as emetics. They are distinguished by giving no precipitate in acid solutions with *sulphuretted hydrogen*, but they yield a white hydrated sulphide of zinc with sulphide of ammonium."

Manufacture.—That the Romans were acquainted with the art of making brass—an alloy of copper and zinc—is proved by the analysis of some of their coins struck soon after the commencement of the Christian era. Yet zinc itself was not known in Europe as a distinct metal until Paracelsus described its distinctive properties in the 16th century. Probably the Roman brass was produced by smelting ores containing both zinc and copper, some of which are at the present day smelted in Sweden. Zinc, however, was brought from the East by the Portuguese long before it became an article of commerce in Europe, and is supposed to have been known and made into articles of use and ornament both in India and China from an early period.

There are several ores of zinc, but only two of much importance—viz., *blende* and *calamine*. *Blende*, black-jack, or sulphuret of zinc, contains, when pure, about 67 per cent. of zinc, but, like most ores, it is rarely found pure. The usual composition of English *blende* is zinc 61, iron 4, and sulphur 33. It occurs in all the older geological formations, and is often associated with the ores of copper and tin, but most frequently with lead ore—occurring, of course, like these in veins. *Blende* crystallises in the form of the rhomboidal dodecahedron. The crystals have considerable brilliancy, but their lustre is waxy rather than metallic. In this country, it is usually of a dark color, from the sulphuret of iron which it contains—hence the miners' name of *black-jack*. Sometimes it is sufficiently argentiferous to allow of the profitable extraction of the silver. *Blende* is found in Wales, Isle of Man, Cornwall, and Derbyshire. It is also found in a good many localities on the continent—Sweden, in particular, being rich in this ore.

Calamine, or carbonate of zinc, contains, when pure, 52 per cent. of zinc, but it varies much in the proportion of metal which it contains on account of impurities. Its primitive crystalline form is the rhombohedron, but *calamine* as well as *blende* occurs more frequently massive than in crystals. It is usually either of a dull yellow or reddish-brown color. Like some other useful substances, *calamine* was formerly exported from England as ballast, through ignorance of its value. It was at one time raised to a considerable extent in Somersetshire, Derbyshire, and Cumberland, but it is chiefly the last county which produces it now. Belgium, Silesia, and Carinthia are well-known continental localities; and quite recently, most extensive deposits of it have been discovered on the north coast of Spain, which are estimated to last for ages.

Red oxide of zinc is found in New Jersey, U. S., where it is smelted. This is an oxide of zinc with a small quantity of oxide of manganese, which gives it its red color. Silicate of zinc, or electric *calamine*, is another rare ore, generally associated when found with *calamine*. It is said to be smelted in the United States, and to yield very pure zinc.

There are several distinct processes for the extraction of zinc from its ores, and of these the English, the Belgian, and the Silesian are the most important. The English process is as follows: The Zinc ore (blende or calamine) is crushed between rollers to the size of hazel-nuts, and then roasted for about twelve hours, with occasional stirring, in a calcining furnace. The furnace in which the roasted ore is reduced very much resembles a glass-furnace. It is either circular or octagonal in form, and usually contains six pots or crucibles, made of Stourbridge fireclay, about 8 feet high by $2\frac{1}{2}$ feet in their widest diameter. In the bottom of each pot there is an opening, from which a sheet-iron tube, in two pieces, descends about 8 feet, and under its open end there is a sheet-iron vessel to receive the condensed zinc. Zinc being volatile at high temperatures, is smelted by distillation, and in the English process it is called distillation *per descensum*. An entire charge—that is, a charge for the whole six pots—consists of one ton of calcined ore mixed with a proper quantity of ground coke. When the pots are charged, their covers are fixed and luted on, the conical portion of the descending pipe being previously securely fixed and lined with fireclay. The hole in the bottom of the pot is plugged with wood, which becomes converted into charcoal by the heat, and is then sufficiently porous to allow the zinc vapor to pass down, while at the same time it stops the descent of the coke or ore. The heat of the furnace is gradually raised, and soon produces vapor of zinc in the pots, which condenses as it descends the pipe, and drops into trays placed at the bottom of each pipe. Sometimes a tube becomes stopped by a lump of zinc, and when this happens, the furnace-man melts it with a bar of red-hot iron. It takes nearly three days to work off the above charge, which yields about 8 cwts. of zinc, and requires about 25 tons of coals for its distillation. It is necessary to watch the pots with great care while the process is going on, as any leakage usually causes much loss of zinc. The *rough zinc*, as it is called, is removed from the pans, where it accumulates in lumps, and melted in cast-iron pots. It is then well stirred and skimmed, and finally cast into ingots or cakes of the ordinary commercial size—the skimmings being worked over again with a new charge of ore.

The Belgian furnace differs greatly in its construction from the English. It consists of from 60 to 80 small fireclay retorts, each about 8 feet 6 inches long, by 8 inches in diameter, and set in a series of rectangular compartments, filling up an arched chamber. There is a clay nozzle or condenser attached to the front of each retort, and on the end of this nozzle there is a sheet-iron receiver, for the condensed zinc. The retorts are charged with ground and roasted calamine, mixed with small-coal free from sulphur. As the upper retorts receive less heat than the lower ones, they are not so heavily charged, and they are, moreover, supplied with less pure ores. At the end of every six hours, the receivers are emptied of their melted zinc. In this process, a ton of ore can be smelted in 24 hours, and the yield from it is about 40 per cent. of metallic zinc.

In the Silesian furnace, fireclay retorts, about 4 feet long by 1 foot 6 inches in diameter, are arranged in two rows, back to back, and placed horizontally on a flat furnace-bed, with a fireplace on a lower level running along between the backs of the retorts. A condensing apparatus comes away with a curve from the upper part of the front of each retort, and descends some 2 feet below it. From this, the zinc, on condensng, drops on the ground, or into a tray placed to receive it.

With regard to the comparative merits of these three processes of smelting zinc, no very decided opinion appears to be yet arrived at by those who have the best means of judging. The Belgian process consumes the least fuel, but requires the greatest amount of labor; the English, on the other hand, is worked with the least amount of labor, but requires the most fuel; whilst the Silesian holds a sort of middle position between those extremes. Each, however, has minor advantages and disadvantages which the others have not. All three processes are in use in England.

Zinc, at ordinary temperatures, is a comparatively brittle metal; but about the beginning of the present century, it was discovered that, if heated to between 200° and 300° F., its malleability and ductility were so increased that it could be rolled with facility into thin sheets, or drawn into fine wire. Since this was known, the uses of the metal, which formerly was only employed along with copper to make brass, have become greatly extended. In sheets, it is used for roofing, baths, water-tanks, spouting, and the like; also for covering ships' bottoms instead of copper. A considerable quantity is consumed for name-plates, for engraving upon,

and for galvanic batteries. Perforated sheets with various ornamental patterns are manufactured for screens, blinds, light fences, and similar objects. As a material for casting artistic works, zinc possesses the desirable properties of having a low melting-point, and of taking a sharp impression from the mould, so as to require but little labor from the chaser; it has also considerable hardness. It has, in consequence, become a favorite material on the continent for making casts of statues, statuettes, and different kinds of ornaments.

Of late years, zinc has been applied with great success to the coating of sheet-iron for roofing and other purposes, and also for coating various kinds of iron wire, especially telegraphic wire. See GALVANISED IRON.

We may remark here, that when zinc is exposed to a moist atmosphere, its surface becomes coated with a thin compact film of oxide or rust, which protects the metal beneath from further oxidation, whereas the rust of iron appears rather to penetrate the body of the metal with greater ease when it has once begun. Hence the value of zinc as a material for roofing and also for protecting the surface of iron roofs.

The average annual produce of the zinc mines of the United Kingdom, for several years past, may be taken, in round numbers, at 15,000 tons of ore, yielding about 4,000 tons of zinc, of the value of from £80,000 to £100,000, according to the market price of the metal, which has varied considerably. Our imports, in like manner, have amounted to about 15,000 tons annually of metallic zinc, the greater part of which came from Prussia, Belgium, and Holland.

Oxide of zinc is now employed to a large extent as a white pigment. It is of a purer color than white lead, does not tarnish and blacken like it with sulphuretted hydrogen, and is much healthier for operative painters, but unfortunately it is deficient in body. It is also used as an ingredient in pottery colors. An impure sulphate of zinc, known as *white vitriol*, is also employed in various arts.

Medical Uses.—In its purely metallic state, zinc produces no effect upon the animal economy, but several of its compounds are very active medicines. As a matter of convenience, we shall consider these compounds alphabetically, beginning with *acetate of zinc*, a salt not considered in the articles on the chemistry of the metal. It is obtained by dissolving, with the aid of heat, carbonate of zinc in a mixture of acetic acid and distilled water, filtering the liquid while still hot, and setting it aside to crystallise. In this process, the carbonic acid of the carbonate of zinc is displaced by the acetic acid, and escapes with effervescence. The salt is obtained in thin translucent, and colorless crystalline plates of a pearly lustre, with a sharp, unpleasant taste, soluble in water, from which it may be precipitated, pure white, by sulphuretted hydrogen, and evolves acetic acid when decomposed by sulphuric acid. The crystals contain 8 equivalents of water, and their composition is represented by the formula, $\text{ZnO}, \text{C}_2\text{H}_3\text{O}_2, + 8\text{Aq.}$ Acetate of zinc is not much employed internally, but it is one of the most valuable local astringents, and is especially useful (in the form of solution of from 3 to 5 grains in an ounce of water) in the treatment of skin-diseases attended with much discharge, such as eczema, impetigo, &c., when the first inflammatory symptoms have subsided; and it forms a useful astringent in the milder form of ophthalmia. It was the active ingredient in Sir Astley Cooper's celebrated injection for gonorrhoea in the third week—six grains of sulphate of zinc mixed with four fluid ounces of dilute solution of subacetate of lead, when sulphate of lead is precipitated, and acetate of zinc is held in solution. When employed as an ointment in skin diseases, from 4 to 10 grains finely powdered may be rubbed up with cold cream or simple ointment. *Carbonate of Zinc* is obtained for pharmaceutical purposes by the decomposition of sulphate of zinc in solution and carbonate of soda, when the carbonate of zinc is precipitated as a white, tasteless, inodorous powder, insoluble in water, but soluble with effervescence and without residue in dilute sulphuric acid. This preparation has been introduced as a substitute for *naties calamina*, which formerly had a high reputation, but was so frequently adulterated as to render an official salt of known composition very desirable. Either in powder, or in the form of ointment, it forms an excellent astringent application for the treatment of intertrigo (or chaffing of the skin), excoriations, and chronic skin diseases attended with much discharge. *Turner's Cerate*, although not in the Pharmacopœia, is in general use as a drying and healing ointment, and is one of the most popular remedies for

superficial burns and sores. It is made by taking prepared calamine (or carbonate of zinc) and wax, $7\frac{1}{2}$ ounces of each, and olive oil 1 pint. Melt the wax, and mix the oil with it, then remove them from the fire, and when the mixture begins to thicken, add the calamine, and stir constantly till they cool. *Chloride of Zinc*, in the form of colorless opaque rods, obtained by pouring the concentrated solution into proper moulds, is used in surgery as a powerful caustic in cases of cancer, fungous growths, &c. In toothache caused by caries, a minute portion of chloride of zinc introduced into the cavity of the tooth after the removal of the diseased parts, affords almost immediate relief. In consequence of its powerfully destructive properties, it should never be applied except by the surgeon. The solution of this salt, commonly known as *Burnett's Disinfectant Fluid*, is of much use in a sick-room or hospital ward as a deodorising agent; as, however, it possesses strong caustic properties, great care must be taken that it is not administered internally in mistake for some other medicine. Few years pass without several fatal cases of this kind being recorded. *Oxide of Zinc* is characterised in the Pharmacopœia as a soft, white, tasteless, and inodorous powder, becoming pale yellow when heated, and forming with diluted sulphuric acid a solution which gives a white precipitate with hydrosulphide of ammonia." It is employed internally with much success as a tonic in chorea and epilepsy, in which it must be given for a considerable period, and in gradually increasing doses till a scruple is taken daily. In doses of one or two grains combined with extract of henbane, it forms an admirable night-pill to check the perspiration in pulmonary consumption. Employed externally, either in the form of powder or ointment it forms a good astringent in cases of excoriation, sore nipples, intertrigo, slight ulcerations, &c. The official ointment containing 80 grains to an ounce of simple ointment, is too strong for ordinary cases, and is apt to cake upon the surface; these defects may, however, be removed by the addition of glycerine. *Sulphate of Zinc* is employed as an astringent, a caustic, an emetic, and a tonic. As an astringent, it is given internally in small doses (of from half a grain to two grains, made in a pill with conserve of roses), in cases of chronic diarrhoea, chronic bronchitis, and long-standing leucorrhœa; while it is used topically as a lotion in old ulcers (from 5 to 20 grains to an ounce of water), as a collyrium in chronic ophthalmia, and as an injection in the abortive treatment of gonorrhœa (i.e., when we wish to cut short the disease before inflammatory symptoms appear). As a caustic, this salt, in its anhydrous state, and finely levigated, was strongly recommended by the late Sir James Simpson. He applied it in the form of powder; or a paste made with glycerine in the proportion of a drachm of the latter to an ounce of the powder; or of an ointment consisting of two drachms of prepared lard, rubbed up with an ounce of the powder. It has also been successfully used in the Dublin hospitals. Sulphate of zinc may be given in the same doses as the oxide as a tonic in cases of nervous palsy, and in the exhaustion dependent upon sexual excesses. In large doses, as from 15 to 30 grains, it operates as a safe and speedy emetic, and is preferable to all other emetics in cases of poisoning. In toxicological researches—as in Marsh's Test for Arsenic—great care must be taken to see that the zinc which is employed is perfectly free from arsenic, which is a not uncommon impurity.

ZINCOGRAPHY is essentially the same art as Lithography (q. v.), zinc-plates being substituted for those of stone. One form of the art is described under the name of Anastatic Printing. (See PRINTING.) A style of it, called Pencilography, brought forward by Gillot of Paris for the purpose of reproducing, by lithographic, autographic or typographic proof, any drawing with crayon or stump, or any engraving from wood or copper, is thus described: A plate of zinc finely polished is prepared, and if an original drawing is to be copied, it is done by the artist in lithographic crayon on this plate; autographic writing done with the crayon, lithographs, and fresh proofs of wood or copper-plate engravings, must be transferred in the usual way to the surface of the plate; and whilst still wet, an ink-roller is passed over, so as to give a deeper impression. Rosin very finely powdered is then sifted over, which adheres to the wet ink, and becomes consolidated, so that the superfluous powder is easily brushed off from the parts not covered with ink. The plate is next placed with its face upwards in a shallow trough containing dilute sulphuric or hydrochloric acid sufficient to slightly cover it; the trough is then gently rocked so as to make the acid flow backwards and forwards over the plate, and if this be contin-

Zingel
Zirknitz

910

ued for some time—an hour or upwards—all the parts of the plate not covered with the ink and rosin are etched deep enough to be used as a relief-plate for printing from. In impressions where there are large interspaces it is usual to saw them out; and in some cases, where it is found that the relief is not sufficiently high, the raised parts are re-inked, and again covered with the rosin, and submitted a second time to the action of the acid. Old engravings may be transferred by laying them to become damp on a board wetted with acidulated water, and then applying the ink-roller to the face of the engraving; the ink only acts upon the ink-lines of the engraving, and is repelled by the acid moisture which has been imbibed by the uncoloured white spaces. A slight pressure will then easily produce a copy on the polished zinc-plate, which is perfected by the subsequent operations.

ZINGEL (*Aepo*), a genus of fishes of the perch family, remarkable for the elongated form of the body, and for having the mouth situated under the projecting and rounded snout, also for the roughness of their scales. The dorsal fins are widely separated, and the ventral fins are large. Only two species are known: of which one, the *Z. of the Danube* (*A. zingel*), inhabits that river and its tributaries, attains a length of fifteen inches, and a weight of two or three pounds; the other (*A. vulgata*) is found in the Rhone and its tributaries, and also in more eastern rivers, although unknown in those of the west of France, and is only six or seven inches long. Both are esteemed for the table.

ZINGIBERACEÆ. See **SCITAMINEÆ.**

ZINZENDORF, Nicolaus Ludwig, Count von, the founder of the existing sect of the Moravian Brethren, or Herrnhuters, was born at Dresden, 9th May 1700. His father, a Saxon state minister, dying while Z. was a child, the latter was educated by his grandmother, a learned and pious lady, the Baroness von Gersdorf. Spencer, the head of the Pietists, was a frequent visitor at her house, and his conversation, and the devotional exercises in which Z. took part, influenced his character while a mere child. In 1710, he went to Halle, where he spent six years, under the special care of Francke, the philanthropist. Z. founded among his fellow pupils a religious society, to which he gave the name of the "Order of the Grain of Mustard-seed." In 1716, he was sent by his relatives to Wittenberg, where Pietism was in less repute than at Halle; but he adhered to his early religious impressions. Two years afterwards, he travelled through Holland and France, everywhere endeavoring to convert the distinguished persons whom he met to his own religious views. On his return to Dresden, he was appointed a member of the Saxon state council, and married the sister of the Count Kense von Ebersdorf. But political life was little to his mind, and he returned to his country-seat in Upper Lusatia. While residing there, he accidentally met a wandering carpenter, named Christian David, a member of the old sect of Moravian Brethren, of whom some still remained in Moravia, professing the doctrines taught by John Huss. David described the persecutions to which the sect were exposed; and Z. invited him and his friends to settle on his estate. They accepted the proposal, and the colony received the name of "Herrnhut." Z. acted with great liberality to the settlers, and their success attracted much attention. In 1734, Z. went under a feigned name to Stralsund to pass an examination in theology, and was ordained a minister of the Lutheran Church. In 1736, he was banished from Saxony, on a charge of introducing dangerous novelties in religion. He repaired to Holland, where he founded a Moravian colony, and afterwards to Esthonia and Livonia, where he also founded colonies. In 1737, at the request of King Frederick-William I. of Prussia, he was ordained Bishop of the Moravians. In the same year, he went to London, where he was received with much consideration by Wesley. In 1741, he went to North America, accompanied by his daughter, and founded the celebrated Moravian colony of Bethlehem. The Herrnhuters, in the meanwhile, by their good conduct and industry, had won the respect of all classes in Saxony, and in 1747, Z. was allowed to return to Herrnhut. Having received authority by act of parliament to establish Moravian settlements in the English colonies of North America, he returned thither to do so. He finally settled at Herrnhut; and his first wife being dead, married Anne Nitschmann, one of the earliest colonists from Moravia. He died on 9th May 1760. Thirty-two preachers, from all parts of the globe, accompanied the coffin to the grave. Z. was the author of more than

100 works in verse and prose. His hymns, used in worship by the Moravians, are objectionable on account of their pious indecency. The same may be said of his sermons, especially of those which refer to the Holy Ghost as a spiritual mother. His writings are often incoherent or mystical, but they abound with passages in which deep and original thought is expressed with great clearness and beauty.—A Life of Z. has been written by Varulagen von Euse, published in his "Biographische Denkmale" (Berlin, 1830).

ZION. Mount Z. is the name of the hill on which the south-west part of Jerusalem, the City of David, or Upper City, with the citadel of David, stood. At the present day, only the north half belongs to the city, the city wall running obliquely over the hill. On the west, and still more on the south side, it descends steeply into the Vale of Hinnom, to a depth of 300 feet. Mount Z. is 2537 feet above the level of the Mediterranean Sea. With the prophets and poets of the Old Testament, Z. often stands for the whole of Jerusalem (also called "Daughter of Zion"), particularly in reference to the Temple. See JERUSALEM.

ZIRCONIUM (symb. Zr. equiv. 44·8—new sys. 89·6) is the metallic constituent of the earth *zirconia*, which is found in association with silica in the minerals *zircon* and *hyacinth*. The composition of zirconia is usually represented by the formula Zr_2O_3 , but Swanberg regards zirconia not as a pure earth, but as a mixture of three; and to one of the metals, whose earth he thinks that he has isolated, he gives the name of *Norium*. The sources from which zirconium is derived are so few (it being found only in Ceylon, one district of the Ural, and Southern Norway), that it is unnecessary to enter into any details regarding it.

ZIRKNITZ, or *Czirknitz*, Lake (Ger. *Czirknitzsee*, *Lacus Lugens* of Strabo), a small lake of Austria, in Carniola, about 20 miles south-southwest of Laibach, and 20 miles east-north-east of Trieste, is situated in a deep valley to the south of Mount Javoruk, and to the north-east of Mount Silvina. The lake is about 5 miles long, and between 2 and 3 broad, is surrounded with numerous villages, chapels, and castles, contains four small islands—on the largest of which is built the hamlet of Ottok—and has no surface outlet. It is about 56 feet deep in the deepest part, and is very irregular in shape. It is worthy of notice only on account of the very remarkable phenomenon of the occasional disappearance of its waters for several weeks, and even months, during which the bottom is often covered with luxuriant herbage, which the peasants make into hay; sometimes also they manage even to sow and reap a small crop of buckwheat in its deserted bed. The waters, however, are not perfectly regular in their disappearance—indeed, sometimes for five or six years together they have not retired at all—but generally they drain off in the end of August, and return, if the season be wet, in five or six weeks. It takes between 20 and 25 days to empty the lake, but the return of the waters is sudden and unexpected, its basin being refilled sometimes in 24 hours. The phenomenon is accounted for by the nature of the bed of the lake. It is composed of limestone, and, like all the Carniolian plateau, is full of deep fissures and caverns, through which the waters disappear at irregular intervals, returning when the rain sets in. Some of these openings are 50 feet deep, and the chief ones are known to the peasantry by particular names. They communicate with subterranean reservoirs, penetrating the interior of the surrounding mountains, through which the waters are replenished or drawn off. There are 12 of these openings which discharge water into the lake as well as draw it off, and 28 which draw it off only. Through the former of these the water pours in after rainy weather as from a spout. When the surface of the lake reaches the caverns of Velka-Karlauza and Malka-Karlauza, the waters are discharged by these into the valley of St. Canzian, and, after disappearing several times, fall into the Unz, above Plunin. Sometimes, however, the volume of water is so great that these caverns prove insufficient to carry it off, when the lake overflows and covers the neighboring country, sometimes submerging villages. In 1684, the lake was drained in January, and remained perfectly dry till the end of February 1835, a circumstance without parallel since the time that any records of its history have been kept. The lake is pretty well stocked with fish, and at certain times is the resort of great numbers of waterfowl, which afford both sport and profit.—There is a small village of the same name on a small stream that falls into the north side of the lake.

Ziska
Zaalam

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ZISKA,* or Ziska, John, of Trocznow, the famous leader of the Hussites, was born at Trocznow, in the circle of Budweis, Bohemia, about 1360. His family being noble, he became a page to King Wenceslas of Bohemia, but his gloomy and thoughtful temperament unfitted him, while yet a mere boy, for the frivolous occupations about court; so, embracing the career of arms, he served as a volunteer in the English army in France, and afterwards joined King Ladislas of Poland with a body of Bohemian and Moravian auxiliaries, and greatly distinguished himself in the war against the Teutonic Knights, deciding the dreadful battle of Tannenberg (in which the Grand Master and 40,000 knights were left dead on the field) by desperate charges at the head of his contingent. High honors were heaped upon him by the king; but the war (in which Z. had lost his right eye) being now over, his restless spirit led him to join the Austrians against the Turks, and subsequently the English against the French; and returning to Bohemia soon after the murder of John Huss (q. v.), he became chamberlain to King Wenceslas. Z. was an adherent of the Hussite doctrine; and the tragical fate of its apostles, and the tyrannical cruelties exercised by the imperial and papal officers on its adherents, excited in his mind the liveliest indignation and resentment. A widespread sentiment of a similar kind, originating as much from patriotic as from religious feelings, existed in the kingdom; and a powerful party was soon formed, which urged upon the king a policy of resistance to the decisions of the Council of Constance. Z. soon became prominent among the leaders of this party, and his personal influence with the king gained for it the latter's sanction to offer resistance, though the king's vacillating disposition incapacitated him from giving effect to his own honest convictions, and taking open part with his subjects against their oppressors. After the outbreak at Prague (30th July 1419), in which the violent behaviour of the Catholics was avenged by the precipitation of 18 magistrates from the council windows, Z. was unanimously chosen leader of the Hussites, and the first great religious conflict of Germany was commenced in earnest. The shock produced by news of this outbreak was fatal to Wenceslas, and his death gave more of a political character to the contest, as when his brother, the Emperor Sigismund (the same who had allowed his safe conduct to Huss to be violated), attempted, by advancing an army of 40,000 men into the country, to obtain the throne, his project was frustrated for a time by the Hussites, who insisted on their religious and political liberties being secured, and totally defeated his army with a hastily levied force of not more than 4000. On the retirement of the imperialists, Z. completed his conquest of Bohemia by the capture of the castle of Prague in 1421 (the town had been taken in the spring of 1420), and secured his hold of the country by the erection of *fortresses*, chief of which was that of Tabor, whence his party derived its name of *Taborites* (q. v.). The varied experience acquired by Z. in foreign warfare was now of immense service to his party; his followers were armed with small firearms (then little known); and his almost total deficiency in cavalry was compensated for by the introduction of the *Wagenburg* (or "cart-fort," constructed of the baggage-wagons), to protect his little army from the charges of the mail-clad knights. Numerous other inventions and ingenious contrivances mark Z.'s brief career as leader of the Hussites, and shew his eminent qualities as an engineer and a general. In 1421, he lost his remaining eye at the siege of the castle of Rabi; but though now totally blind, he continued to lead on his troops to a succession of victories almost unexampled in history—the list of 18 pitched battles fought by him, always with much inferior force, including only one defeat, and that so much resembling a drawn battle, that his opponents dared not molest his retreat. His greatest achievements were the rout (18th January 1433) of Sigismund's second invading army, which was driven into Moravia, and 9000 men of it drowned in attempting to escape across the frozen Igau; and his great victory at Aussig, over the German crusading army, commanded by Frederick the Warlike of Saxony, and the Elector of Brandenburg. In the latter conflict, the furious onset of Z.'s troops was steadily sustained by the Saxons, who were choice troops, and the fanatic

* It is often stated that John of Trocznow was called Z. on account of his being "one-eyed," but this is erroneous; Z. was the name of the family for generations before his time, nor does it signify "one-eyed" in either the Bohemian or the Polish language.

Hussites recoiled in astonishment at a successful resistance which they had never before encountered. Z., apprised of the circumstances, approached on his cart, thanked his men for their past services, adding, "and if you have now done your utmost, let us retire." Thus stimulated, they made a second charge still more furious than before, broke the Saxon array, and left 9000 of it dead on the field. Sigismund was now convinced that the conquest of Bohemia was impossible, and after a time proposed an arrangement with the Hussites by which full religious liberty was allowed; and Z., who had an interview with the emperor on the footing of an independent chief, was to be appointed governor of Bohemia and her dependencies. But the war-worn old chief did not live long enough to complete the treaty, for, while besieging the castle of Przbislav, he was seized with the plague, and died, 12th October 1424. He was buried in a church at Czaslav, and his iron war-cloak was hung up over his tomb. A foolish story was long current that, in accordance with Z.'s express injunctions, his skin was flayed off, tanned, and used as a cover for a drum, which was afterwards employed in the Hussite army; in order that even when dead he might be a terror to his enemies.

The only accusation which can with justice be made against Z. is on the ground of excessive cruelty, the victims being the monks and priests who fell into his hands. It would have been extremely curious if Z. had not laid himself open to such a reproach, for the burning alive of the propagators of the faith to which he adhered, the atrocious cruelties practised on such Hussite priests as fell into the hands of the imperialists, and the seduction of his own favorite sister by a monk, were events ill calculated to induce him to moderate the hatred entertained by himself and his followers against their opponents. The war was carried on mercilessly by both parties, and it was unreasonable to expect that the party assailed, and the one numerically weaker, should first set an example of moderation.

ZITTAU, a town of Saxony, 48 miles east-south-east of Dresden and 69 by railway, is situated near the Bohemian frontier, close to the junction of the Neisse and Mandau. The town is well built, and is surrounded by a double wall; has many churches, the most notable of which is the Byzantine Church of St John, finished in 1886; a splendid court-house, one of the finest in Saxony, erected 1844; a good library of 12,000 vols.; a gymnasium, a normal, a free, an industrial, a Catholic, an infant, and other schools; several charitable institutions—as a work-house, infirmary, asylum for orphans, &c. Z. is the centre of the linen and damask manufacture of Saxony. There are also woollen manufactures, bleachfields, dye-works, paper, oil, and saw mills, and iron-foundries. Its position on the railway into Bohemia led the Prussians to make it a centre of operations during the war of 1866. Pop. (1875) 20,417.

ZLATOU'ST, or Ključ (Golden Month), a town of Russia, in the government of Orenburg, among the Ural Mountains, about 160 miles north-east of Ufa, on the river Ufa. It consists chiefly of wooden houses, and the inhabitants are mostly miners. It is the centre of the iron and gold mines of the district. There is an extensive manufactory of sword-blades, which are considered the best in the empire; other articles of inlaid and embossed steel are also manufactured. Pop. 15,000.

ZMEINOGORSK, or Zimief, a town of Siberia, in a mountainous district of the government of Tomsk, upwards of 350 miles south-west of the town of Tomsk, on the river Smievka. The town is situated in the vicinity of one of the most productive silver-mines in Siberia, which was discovered in 1730, and belonged to the Demidoff family till 1745, when it became crown property. Since its discovery, it has yielded nearly a half of all the silver produced by the Siberian mines. Pop. 5990.

ZNAIM, or Znaim, a town of the Austrian Empire, in Moravia, on a rising ground close to the left bank of the Taja, 48 miles north-by-west from Vienna. It is celebrated for the conflict which took place here between the French and Austrians, on June 14, 1809, in which the French were victorious (see **WAGRAM**). A castle on a height, the ancient residence of the princes of Moravia, is now a military

Zoar
Zoetrope

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hospital. Near it is a circular church, supposed to be as old as the 12th c. Pop. (1869) 10,000.

ZOAR, a village in Ohio, U. S., on the Ohio Canal, 90 miles e.n.e. of Columbus, settled in 1817, by a German community, "The Society of Separatists of Z.," who hold in common 9000 acres of land; they have a woollen factory, mills, a store, church, school, and other social and industrial establishments, all managed by trustees, elected by popular vote. Pop. in 1870, 826; in 1880, 291.

ZO'BO, a hybrid between the Yak (q. v.) and the common ox of India. It is not very unlike an English ox. It is common in the western parts of the Himalaya, and is valued as a beast of burden, as well as for its milk and its flesh.

ZOCLE, or **Socle**, a square plain plinth under the base of a column.

ZO'DIAC (Gr. *zōdiakos*, commonly derived from *zōon*, an animal) the name given by the ancients to an imaginary band extending round the celestial sphere, having as its mesial line the ecliptic or apparent path of the sun. It was fixed at about 16° in width, for the purpose of comprehending the paths of the sun and of the five planets (Mercury, Venus, Mars, Jupiter, and Saturn), which were then known; and as, of these planets, Mercury has by far the greatest inclination of orbit to the ecliptic, and the value of that element in his case is only 7° 0' 9", the width given to the zodiac was amply sufficient for the required purpose. But when the career of planetary discovery commenced in the beginning of the 16th c., the first three which were discovered (Ceres, Pallas, and Juno) at once destroyed the idea which had been long seated in men's minds, that no planets existed beyond the limits of the zodiac, by exhibiting orbits inclined to the ecliptic, at no less angles than 10° 36½', 84° 42½', and 19° 3½'; and a large number, since observed have been found to wander from 0° to 15° beyond the zodiac, from which circumstance they have, along with the three above mentioned, been denominated *ultra-zodiacal* planets. The stars in the zodiac were grouped into 12 constellations, to each of which 30° or 1-12th of the whole circle was assigned, though it often did not fill up that space, but was only situated in it; and this equitable division into *signs* was of great advantage in defining the positions of the sun and planets at any epoch.

The constellations are as follows:

Aries (*Ram*).
Taurus (*Bull*).
Gemini (*Twins*).
Cancer (*Crab*).
Leo (*Lion*).
Virgo (*Virgin*).

Libra (*Balances*).
Scorpio (*Scorpion*).
Sagittarius (*Archer*).
Capricornus (*Goat*).
Aquarius (*Water-bearer*).
Pisces (*Fishes*).

As one half of the ecliptic is to the north, and the other to the south of the equator, the line of intersection of their planes is a diameter of each, and the two points in which this line meets the celestial sphere are known as the equinoctial points. The comparative immobility, with respect to the ecliptic, of these points, suggested at once the employment of one or other of them as a point from which to reckon, and accordingly that point at which the sun crosses the equinoctial from south to north was fixed upon, and called the first point (or commencement) of Aries. After the sun had advanced eastward through this sign—i. e., 90° along the ecliptic—he entered the sign of Taurus, continuing his course onward through the others in the order in which they are given above, again crossing the equinoctial southwards at the point where he emerged from Virgo, and entered Libra. This was the case with the sun during the time of Hipparchus (q. v.), but though the equinoctial points move very slowly, yet they do so with great uniformity, and the westerly motion of 50" annually which they describe along the ecliptic, has at the present time separated the sign Aries from the constellation Aries, and caused the former to correspond almost to the constellation Pisces. This gradual retrogression of the signs through the constellations of the zodiac will continue till they accomplish, in about 25,968 years, a complete circuit; after which period the sign and constellation of Aries will coincide, as they did in the time of Hipparchus. Neither the zodiac nor its constellations are of much use now in astronomy, except as, like the other con-

stellations, affording an easy though somewhat fantastic nomenclature for the stars, and a rude, but sometimes convenient mode of reference to their positions.

The porticos of the temples of Denderah and Esne in Egypt have representations of the zodiacal constellations, which are of great antiquity, and have formed a fruitful theme of discussion. M. Dupuis, in his "*Origine des Cultes*," has, from a careful investigation of the position of these signs, and calculating precession at its usual rate, arrived at the conclusion that the earliest of them dates from 4000 B. C. This conclusion is controverted by M. Fourier, in his "*Recherches sur les Sciences, &c. de l'Egypte*," who makes the representations at Esne 1800 years older than the other; but his hypothesis has been in turn overthrown by MM. Ideler and Biot. The truth seems to be that nothing is as yet definitely known respecting these ancient representations; for the manner in which the investigations have been mixed up with the Biblical question of the antiquity of man, has prevented any truly scientific research. The Greeks would seem to have borrowed their constellations from the Egyptians and Babylonians, and this is corroborated, to some extent, by occasional remarks in Greek writers as to the positions of various constellations at certain times, which positions are inconsistent with the supposition of the observer being in Greece. The zodiacal figures of the Hindus, ancient Persians, Chinese, and Japanese have such a remarkable resemblance to those of the Egyptians, that there can be little doubt as to their common origin.

ZO'DIACAL LIGHT is the name given to a singular appearance seen after sunset or before sunrise, at all seasons of the year in low latitudes, but rarely in this country, except in March, April, and May in the evenings and six months later in the mornings. It is obviously due to illuminated (partly, perhaps, self-luminous) matter surrounding the sun in a very flat, lenticular form, nearly coinciding with the plane of the ecliptic, or rather with the sun's equator, and extending to a distance from the sun greater than that of the earth, since its apex is often seen more than 90° from the sun. It seems to have been first distinctly pointed out by Cassini, and was long regarded as the sun's *atmosphere*. This idea, however, is totally irreconcilable with mechanical principles; since, to assume so flat a form, in spite of the enormous attraction of the sun, and its own elasticity, an atmosphere would have to revolve with a velocity so great as to dissipate it into space. The only conceivable explanation of the phenomenon is, therefore, to be found in supposing it to consist (like the rings of Saturn) of an immense assemblage of small cosmical masses, rocks, stones, and pieces of metal, such as are continually encountering the earth in the form of *aérolites* or meteorites. For the dynamical stability of such a system, it is only necessary that each fragment should separately describe its elliptic orbit about the sun. The mutual perturbations of the system, on account of the enormous mass of the sun, will be exceedingly small, except in the case of actual collision; but some of the planets will have a considerable effect upon it. That this is the true explanation of the phenomenon, is now generally believed. Some very curious recent observations, on the August and November meteorites of 1866 (see **METEORS**) have shown that these bodies move in orbits almost exactly the same as those of two known comets. The comet, then, is merely that portion of the ring of small masses, revolving all nearly in the same orbit, where the greatest number are, for the time, collected; and it is possible that the collisions, which must most frequently occur where the separate particles are most numerously grouped, are one of the spectral phenomena of incandescent gases which have been observed in the heads of comets by Huggins and others. Such speculations, were this the place to pursue them, might easily be extended to the sudden production, and changes of form, of the tails of comets which occur near perihelion, for there the separate masses must necessarily be much more crowded together, and their impacts must be increased both in number and violence.

ZOETROPE, or Wheel of Life, an optical instrument, so named from its exhibiting pictures of objects as if endowed with life and activity. Although only of late years introduced from America, under this name, the instrument itself, which is simply a cylindrical thaumatrope, was invented and made the subject of a patent so long ago as the year 1860. Mr Peter Hubert Desvignes, the inventor, in his published specification, has very fully described various modifications of the cylindrical thaumatrope; and the instruments which, under the name of *Mimoscope*, he

Zollus
Zollverein

. 916

contributed to the London Exhibition of 1862, being furnished with pictures of exquisite artistic finish and beauty, were deservedly rewarded with "honorable mention." Mr Desvignes also proposed a stereoscopic form of the instrument, in anticipation of the one already described under Stereoscope (q. v.), and has employed models, insects, and other objects, instead of pictures, with perfect success. The truly marvellous results shewn in this instrument depend, primarily, on the well-known fact, that vision "persists" for a certain short interval of time after the occlusion of the visual ray. It follows from this principle, that, if a series of pictures, representing the different attitudes successively assumed by an object in completing a given movement, be presented to the eye so quickly that the visual impression of each picture shall continue until the incidence of the one next following, the object will remain constantly in view, and its various parts will appear to execute the movement delineated by the pictures. The zoetrope in its most popular, but by no means most excellent form consists of a cylinder of strong card-board, 19 inches in diameter, and 7½ inches in depth, with a metal rim at the top, and fastened to a circular piece of wood. The latter is screwed at its centre to a pivot, which moves freely within the upright of the stand, and forms a vertical axis, round which the cylinder may be made to revolve with any desired rapidity; the cylinder has thirteen equidistant apertures, each 3-16 inch in width, and 8 inches long. Each series of pictures is printed on a strip of thick paper, 3½ inches in breadth, and 36 inches in length. In using the instrument, illuminate it well from above, and, having placed the picture-strip within the cylinder, immediately beneath the apertures, rotate the cylinder with the requisite velocity (which will vary according to the nature of the subject), and look through the apertures at the pictures upon the opposite side of the cylinder. To avoid the grotesqueness of a number of groups all seen performing the same movement at the same time, Mr Desvignes devised the thaumatrope, in which the cylinder turns upon a horizontal axis; and by means of an aperture at the bottom of the hood, the sight is limited to the space occupied by a single group on the opposite side of the cylinder, and, both eyes being brought into simultaneous activity, the clearness and pleasantness of the illusion are greatly enhanced. In this arrangement, the groups are arranged, on the strips, one above another, and not side by side, as in the former; and they are perforated with apertures to correspond with those on the cylinder. As has been pointed out by Mr Desvignes, the width of the apertures should never exceed one-sixteenth of an inch; and the exterior of the instrument should be painted mat black.

We will now speak of the principles which determine the character and distinctness of the illusion, and first of all, will endeavor to explain why it is that the pictures, looked at through the apertures, are plainly visible; whereas, viewed over the top of the revolving cylinder, they run into an indistinguishable mass.

The effect of the apertures, in this regard, is two-fold; they limit the *time* during which each group is pictured upon the retina; and they limit, or should be made to limit, the *quantity* of each group at any one instant so depicted. Obviously, if the view be *instantaneous* only, the group in that minute interval of time will not have moved to a *perceptible* degree, and will therefore appear stationary. It is for this reason that the apertures should be made very narrow (not exceeding one-sixteenth of an inch, as above stated), and then, the eye being placed close to them, the retinal images will not be blurred—as with wider apertures, and consequent increased motion of the pictures while under view, they would be—and the maximum of *definition* is thus attained. But, in this case, both the quantity of light reaching the eye, and the time of its operation, are insufficient, which defects can only be compensated by setting the instrument in violent motion, thus occasioning an inconveniently rapid recurrence of the retinal impressions. Instead, therefore, of letting the whole picture be seen for a *single* instant, let us increase the total time of visibility by arranging that successive small portions of the pictures shall be seen in *successive* instants. This is effected by withdrawing the eye a few inches from the aperture; for the eye being at the apex of the visual angle, the farther it is removed from the aperture, the greater is the distance *within the visual angle* through which the aperture must travel; and prolonged in a like degree will be the *total time of visibility* for each picture. But here another difficulty is evoked, manifesting itself in one of the most puzzling phenomena of this curious instrument. The pictures are seen

as *sensibly diminished in breadth*, the explanation of which is as follows: The longer the time of visibility, the greater will be the onward movement of the picture while under view; therefore, if the left-hand side of the picture come first into view, by the time the advance of the aperture permits of the right-hand side being seen, the latter will have progressed *towards the left*, and it will accordingly be seen relatively nearer to the left side than is its natural position. And this compression, of course, takes effect over the whole of the picture. In the exquisitely elaborate drawings prepared by Mr Desvignes, this compression was allowed for, to the great enhancement of the effect.

Lastly, of the effects due to the pictures themselves. If the pictures on the strip be the same in number as the apertures, the pictures will either coincide with the apertures, in point of position, or will be equidistant, each from its adjacent aperture: in which case there will be no apparent shifting of the pictures—either to right or left. But if there be 12 pictures and 13 apertures, the picture-interval will be greater than the aperture-interval, and only one picture on the strip can be coincident with an aperture; the rest will be situated in advance of the apertures, each succeeding one slightly more than its predecessor; and, as a consequence, seen through the apertures of the revolving cylinder, they will appear continuously to advance. The contrary will be the case, if the number of the pictures exceed that of the apertures. These curious properties, which make it possible to exhibit figures moving either backwards or forwards, as well as with movements proper to themselves, were fully investigated by the late Professor Faraday; and we would recommend those interested in the subject to refer to his *Memoir on Optical Deceptions*, contained in his “*Experimental Researches in Chemistry and Physics*,” pp. 391, *et seq.*

ZOILUS, a grammarian, born at Amphipolis. Authorities vary respecting the age in which he lived, and the manner of his death. The usual account is that he lived in the time of Ptolemy Philadelphus, and that he solicited, but without success, the patronage of that monarch. He gained notoriety for the bitterness with which he attacked Homer, whence he was surnamed *Homeromastix*, Homer's Scourge. His name is used proverbially for an austere and malignant critic, as Aristarchus is for one caudid and intelligent. All his works are lost.

ZOLLVEREIN (Ger., meaning “custom-union”), a union of different independent German states, under the leadership of Prussia, so as to enable them, in their commercial relations with other countries, to act as one state. When, after the war of liberation in 1816, the political union, destroyed by the downfall of “the holy Roman Empire,” had been restored to a certain degree in the German “*Bund*” (see GERMANY), internal commerce was felt to be trammelled and depressed by the collection of revenue at the frontiers of every petty state; nor was it possible, without united action, to carry out the policy in regard to foreign commerce which might be thought best for protecting and developing the native trade and manufactures. The first suggestion of such a union came from Prussia; but it took many years before an actual beginning was made, and still longer before it reached its ultimate extent, as the plan was opposed for a long time by the jealousies and special interests of many of the states.

From 1819 to 1828, only some of the minor principalities enclosed within the Prussian territories had been got to conform to the Prussian commercial system; but in 1828, Hesse-Darmstadt, and in 1831, Hesse-Cassel, gave in. This was followed, in 1833, by the accession of Bavaria, Wurtemberg, the kingdom of Saxony, the principality of the same name, Schwarzburg, and Reuss; and in 1835—1836, by that of Baden, Nassau, and Frankfurt-on-the-Main. The adhesion of Hanover did not take place till 1861, of Oldenburg till 1852. When in 1866 Lübeck and the two duchies of Mecklenburg had joined the Z., its territory extended over the whole of what subsequently became the German empire, with the exception of Hamburg, Bremen, and a small part of Baden near Schaffhausen. The Reichsland of Alsace-Lorraine was incorporated in 1871. The imperial constitution of April 16, 1871, recognises and ratifies the privilege of the free ports so to remain until “they themselves demand admittance within the common customs-boundary.”

The principle of the Z.'s action was this: The whole territory embraced by the Union formed commercially (in regard, at least, to countries beyond its limits) one state. The duties on exports, imports, and through-transports were collected at all

the frontiers of the Union according to a uniform tariff (subject to some concessions, made on special grounds, to individual states); and the proceeds, after paying the expenses of collection, were divided among the members of the Union in proportion to their several populations. In regard to the internal trade of the Union, as the duties on articles manufactured for home consumption were different in the different states, a complicated system of drawback came into play, in order to put the commerce of all on an equal footing.

The treaty of union was agreed upon for a definite period of years, and was renewed from time to time; as in 1842, 1853, 1865, 1867. In the latter year, much was done to simplify the relations of the various states to one another in respect of internal trade; and the administration of the Z. was so modified as to give to the various members of the Union votes in its council and parliament proportionate to the number of inhabitants in each state.

Since the establishment of the German empire, the Z. has no longer a separate constitution of its own. Its council (representing governments) is merged in the Federal Council of the empire; its parliament (representing populations) in the Reichstag. Affairs are managed on the principles adopted by the Z. in 1867, by permanent committees of the Federal Council—viz., those for customs and taxes, for trade and commerce, and for finance.

The net income of the Z., which in 1834 amounted only to 12,178,761 thalers, had risen in 1871, the last year in which the Z. had separate accounts, to 23,000,003 thalers (above £4,000,000).

ZO'MBOR, a royal free town of Hungary, on a plain about 120 miles south of Pesth, capital of the district of Bacs, near the Francis Canal. It has handsome county buildings, Greek and R. C. churches, gymnasium, barracks, town-house, &c. There is a brisk trade in grain and cattle. Pop. (1869) 24,809.

ZONU'RIDÆ, a family of saurian reptiles, having the head covered with regular polygonal shields, the body and tail with large scales; the sides furnished with a longitudinal fold of the skin, covered with small scales; the tongue flat, nicked at the tip, the eyes with two valvular lids. The species are numerous, natives of warm climates. The form of some is rather short and thick, others are long and serpent-like. In some also, the limbs are well developed, in others they are merely rudimental, and in some the very rudiments of them are entirely concealed under the skin.

ZOO'LOGY (Gr. *zōon*, an animal, and *logos*, a discourse), the science which has for its subject the Animal Kingdom (q. v.). This science, itself a branch of Natural History (q. v.), is divided into a number of branches, which are often pursued as distinct sciences, the subject being too large to be thoroughly studied except in this manner; although it is also necessary that the results of investigation in particular departments should be brought together, so that the animal kingdom may be viewed as a whole, and the relations of the most widely different groups of animals to each other determined. The number of species of animals is far greater than that of plants, and the diversity among them is also greater, so that a division of the science of Z. into branches relating to different groups, very naturally takes place. Thus, the branch of Z. which has the *Mammalia* for its subject has been called *Mazology* (Gr. *mazon*, a tent), an unhappy choice and essentially incorrect term, which has not come into general use; and it is a curious circumstance that this, which may be called the highest branch of Z., has no popularly received name. It is otherwise with the branches of Z. relating to the inferior classes of *Vertebrata*; that which has *Birds* for its subject is universally known as *Ornithology* (q. v.); that which relates to *Reptiles* is *Herpetology* (q. v.), and the subordinate branch relating to serpents is sometimes called *Ophiology*; that which relates to *Fishes* is *Ichthyology* (q. v.). Among *Invertebrate animals*, the great group of *Mollusca* is the subject of the science of *Malacology* (q. v.), although this term is not in such general use as some of those already mentioned; and when shells rather than the animals which bear them are considered, the term *Conchology* (q. v.) is employed. No particular term is commonly applied to the branches of Z. which treat of the *Crustacea*, *Arachnida*, &c.; but that which relates to *Insects* is universally known as *Entomology* (q. v.), and the term *Helminthology* (q. v.) is employed to designate that which has *Worms* for its subject. No

similar terms are used for the branches of this science which relate to other groups of *Invertebrata*.

The science of Z., however, divides itself into distinct sciences, not only in accordance with the divisions of the animal kingdom, but also with regard to particular branches of the subject which may be studied either in relation to animals generally, or to any particular species. Thus, *Anatomy* (q. v.) may be regarded as a branch of Z., when the term Z. is taken in its largest sense, as including man along with the inferior animals, and *Ethnology* (q. v.) must in like manner be considered as belonging to it. The anatomy of the inferior animals* is sometimes called *Zootomy*, and the term *Comparative Anatomy* is employed when their structure is studied in relation to that of man, and the structure of one division of the animal kingdom in relation to that of the others. *Physiology* (q. v.) is one of the most important branches of Z.; and with it that branch of chemistry which treats of animal substances is closely connected. A very interesting branch of Z. is that which relates to the habits and instincts of animals. It can hardly be said to have been constituted into a separate science, but has received much attention from those naturalists who have devoted themselves to the study of particular groups of animals.

We have no evidence that the study of Z. was prosecuted to any considerable extent before the time of Aristotle. In his hands it became at once a science, and the foundations of a system of classification were laid. No artificial system of classification has ever been proposed in Z., like the sexual system of Linnæus in botany; but from the very first to the present day, a natural grouping of animals has always been attempted. To this, the widely marked distinctions between the principal groups almost unavoidably led. Aristotle brought to bear upon the subject the highest powers both of observation and of generalisation, and some of the groups established by him still retain their place in the most modern systems. Aristotle divided the whole animal kingdom into two great sections, the highest, *Enatma*, consisting of animals having blood (i. e., red blood), and the lower, *Anatma*, of animals having a colorless fluid instead of blood, the former corresponding to the *Vertebrata*, and the latter to the *Invertebrata* of modern zoologists.

No other ancient writer deserves much notice in a historic sketch of zoology. *Ælian* and *Pliny* shew no capacity for the scientific treatment of the subject, and in their writings, facts are largely mingled with fables. During the middle ages, Z. like other kindred sciences, was almost completely neglected. For many centuries, the only name worth mentioning, in connection with the history of the science, is that of Albert, Count of Bollstädt, commonly called Albertus Magnus; whose knowledge, however, was entirely derived from Aristotle and other ancient authors, and all he did was merely to call attention to the forgotten science, without making any contribution to its advancement. From his time, in the first half of the 13th c., to the beginning of the 16th, Z. was again almost completely neglected; but the new activity of mind which then displayed itself soon sought this as well as other directions, and an impulse was more especially given to Z. as well as to some other branches of science, by the progress of geographical discovery; curiosity being awakened with regard to the strange productions of the New World, and of the eastern and southern regions, till then equally unknown. The names of *Belon* (q. v.) and *Rondelet* are the two greatest in this department at this period, and by them Z. was enriched with many new facts, while attempts were also made at a more perfect classification. *Aldrovandi* and *Gesner* (q. v.) soon followed them, besides others who began to direct their attention more specially to particular branches of Z., some of whom greatly extended the science by their observations on the animals of newly discovered countries. It was not till after the middle of the 17th c., however, that any real progress was made in classification, founded upon a philosophical study and comparison of animals. The works of *Ray* (q. v.) are described by *Cuvier* as "the foundation of modern zoology." The materials, however, were in great part prepared, and the first outline of a system sketched by *Willughby*, the friend of *Ray*, whom *Ray* long survived, and whose works he edited. From the days of Aristotle, Z. had never been prosecuted with such acuteness of observation, accuracy of description, and breadth of philosophical generalisation as it was by *Willughby* and *Ray*. The progress of the science now became very rapid. *Buffon* won for it, by his interesting

descriptions and brilliant style, the general attention of the educated portion of society, not only in his own but in other countries, and was almost immediately followed by Linnæus, who, extending his studies from botany to Z., not only extended the science by his own observations and discoveries, but rendered it far greater service by gathering together the facts ascertained by others, and by the improvement which he effected in classification. Some of the larger groups established by Linnæus, have been retained by all subsequent naturalists without essential modification of their characters, and even his smallest groups—genera—have been very generally retained, although now regarded as constituting tribes or families. According to the Linnæan system, the animal kingdom is divided into six great classes, which are further brought together in groups of two each, as follows:

Heart bilocular, with two auricles,	Viviparous.	1. Mammalia.
blood warm, red,	Oviparous.	2. Birds.
Heart unilocular, with one auricle,	With lungs.	3. Amphibia.
blood cold, red,	With gills.	4. Fishes.
Heart unilocular, with one auricle, circulating fluid (<i>sanies</i>) cold, white,	With antennæ.	5. Insecta.
	With tentacula.	6. Vermes.

The orders into which Linnæus divided these classes have, in the most important instances, been already noticed, either under the classes, or separately. It was, however, in constituting and defining the genera that Linnæus shewed in the highest degree his powers both of observation and arrangement. His labors in the lower departments of the animal kingdom were much less perfect than in the higher; but others speedily entered upon the field, and whilst new species of animals and their habits continued to be described, the study of comparative anatomy was also diligently prosecuted, and thus preparation was made for a more complete and philosophical system of zoology. The names of Pallas, Hunter, and Blumenbach are particularly worthy to be noticed; but more than any other, the name of Cuvier, who, like Linnæus, took a comprehensive view of the whole subject of Z., and carried forward the work of minute observation as well as of generalisation. His system of classification is rather an improvement of that of Linnæus than one fundamentally new, and it has formed a new starting-point for all further progress. The divisions, the classes, and many of the orders of Cuvier's system have already been noticed under their proper heads, so that it may be enough here to give the most general outline of the system, shewing Cuvier's four great divisions of the animal kingdom, and the classes which he arranges under them.

Div. I. VERTEBRATA.	Class I. Mammalia.
	" II. Aves (Birds).
	" III. Reptilia (Reptiles).
	" IV. Pisces (Fishes).
Div. II. MOLLUSCA.	Class I. Cephalopoda.
	" II. Pteropoda.
	" III. Gasteropoda.
	" IV. Acephala.
	" V. Brachlopoda.
	" VI. Cirrhopoda.
Div. III. ARTICULATA.	Class I. Insecta (Insects).
	" II. Crustacea.
	" III. Arachnida.
	" IV. Annelida.
Div. IV. RADIATA.	Class I. Echinodermata.
	" II. Entozoa.
	" III. Aculephæ.
	" IV. Polypl.
	" V. Infusoria.

The system of Cuvier has been modified by Lamarck, Virey, Dumeril, De Blainville, F. Cuvier, and others; and in consequence of the progress of scientific discovery, more considerable changes have recently been proposed by eminent naturalists, some of them amounting almost to a reconstruction of the greater part of the sys-

tem; whilst in particular departments, and especially those which contain the lower forms of animal life, Cuvier's arrangement, regarded by himself as merely provisional, may be said to have already become completely antiquated.

A complete system of the animal kingdom has been proposed by Agassiz. He adopts the four great divisions of Cuvier, but makes much change in the subdivisions, acknowledging, however, that much is still uncertain, and that a satisfactory arrangement must depend upon anatomical and embryological researches yet to be made. The following is an outline of his system:

DIVISION I.—RADIATA.

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| Class I. Polypt, | Order 1. Actinoidæ. |
| | " 2. Halcyonoidæ. |
| " II. Acalephæ. | Order 1. Hydroidæ (<i>including Siphonophoræ</i>). |
| | " 2. Decaphoræ. |
| | " 3. Ctenophoræ. |
| " III. Echinodermata, | Order 1. Crinoidæ. |
| | " 2. Asteroïdæ. |
| | " 3. Echinoidæ. |
| | " 4. Holothuridæ. |

DIVISION II.—MOLLUSCA.

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| Class I. Acephala, | Order 1. Bryozoa (<i>including the Vorticellidæ</i>). |
| | " 2. Brachyopoda. |
| | " 3. Tunicata. |
| | " 4. Lamellibranchiata. |
| " II. Gasteropoda, | Order 1. Pteropoda. |
| | " 2. Heteropoda. |
| | " 3. Gasteropoda <i>proper</i> . |
| " III. Cephalopoda, | Order 1. Tetrabranchiata. |
| | " 2. Dibranchiata. |

DIVISION III.—ARTICULATA.

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| Class I. Vermes, | Order 1. Trematoidæ (<i>including Cestoidæ, Planariæ, and Hirudinidæ</i>). |
| | " 2. Nematoidæ (<i>including Acanthocephali and Gordiaces</i>). |
| | " 3. Annelidæ. |
| " II. Crustacea, | Order 1. Rotifera. |
| | " 2. Entomostraca (<i>including Cirrhopoda</i>). |
| | " 3. Tetradeapoda. |
| | " 4. Decapoda. |
| " III. Insecta, | Order 1. Myriapoda. |
| | " 2. Arachnida. |
| | " 3. Insecta <i>proper</i> . |

DIVISION IV.—VERTEBRATA.

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| Class I. Myzonta, | Order 1. Myxinoidæ. |
| | " 2. Cyclostomata. |
| " II. Pisces (<i>Fishes proper</i>), | Order 1. Ctenoidæ. |
| | " 2. Cycloïdæ. |
| " III. Ganoidæ, | Order 1. Cœlacanthidæ. |
| | " 2. Acipenseroidæ. |
| | " 3. Sauridæ. |
| | " 4. Siluridæ. |
| | " 5. Plectognathæ. |
| | " 6. Lophobranchiæ. |
| " IV. Selachia, | Order 1. Chimære. |
| | " 2. Galeodes. |
| | " 3. Batides. |

Zoophyte
Zoroaster

" V. Amphibia,

Order 1. Cœciliae.

" 2. Ichthyodil.

" 3. Anura.

" VI. Reptilia,

Order 1. Serpentes.

" 2. Sauroi.

" 3. Rhizodontes.

" 4. Testudinata.

" VII. Aves,

Order 1. Natatores.

" 2. Grallæ.

" 3. Rasores.

" 4. Insessores (including Scansores and Accipitres).

" VIII. Mammalia,

Order 1. Marsupialia.

" 2. Herbivora.

" 3. Carnivora.

The three Cuvierian divisions of *Vertebrata*, *Mollusca*, and *Articulata* have been very generally retained by systematic zoologists, without much change as to the classes or even orders of animals included in each, although it is now generally admitted that the *Cirrhopoda* are not to be ranked among the *Mollusca*, but as *Crustaceans*, among the *Articulata*; and the *Polyzoa* or *Bryozoa*, formerly placed with other "zoophytes" among the *Radiata*, have been removed by many naturalists to a place among the *Mollusca*. Amongst the *Radiata* of Cuvier, great changes have been made; and it may be well to indicate here some of the chief of the new groups which have been proposed, and pretty generally accepted by naturalists, although their proper order and their relations to each other cannot be so well set forth as in those departments of the animal kingdom which have been more thoroughly studied. Greater importance has been assigned by recent naturalists than by their predecessors to the nervous system as a basis of classification. The lowest animals, those in which no trace of a nervous system has been discovered, have been formed into a separate division of the animal kingdom, under the names *Acrata* and *Protozoa* (q. v.), the latter of which has obtained general preference. Higher in organisation than the *Protozoa* are the *Nematoneura* of Owen, having a nervous system distinctly traceable in a filamentary form, and including all the higher orders of Cuvier's *Radiata*. Some groups, as *Anthozoa* (see ZOOPHYTE), still occupy a doubtful intermediate place between *Protozoa* and *Nematoneura*. To the *Articulata*, Owen has, with regard to their nervous system, given the name *Homogangliata* (q. v.), and to the *Mollusca* the name *Heterogangliata* (q. v.). In like manner, he has recently introduced in his classification of the *Vertebrata* the terms *Hematothormal* and *Hematoeryal*, these being merely words formed from the Greek, and signifying respectively *Warm-blooded* and *Cold-blooded*, the former including *Mammalia* and *Birds*, the latter, *Reptiles* and *Fishes*. Further information about the recent classification of some of the lower groups of animals, will be found in the article *WORMS*.

In the study of Z., far more attention has been paid recently than formerly to the relation which each part of the animal organisation bears to the whole, as the Respiratory System to the Circulatory System, the Digestive System, the Nervous System, &c. The study of the science has thus become more philosophical, and the view obtained of nature more complete; and if the difficulty of classification is found greater than when characters derived from particular parts of the organisation were more exclusively regarded, the result, when fairly wrought out, is a system at once more perfect and more natural.

ZOOPHYTE (derived from the Greek, *zoon*, an animal, and *phyton*, a plant, and signifying an animal-plant) is a term which was employed by Cuvier in the same sense as he employed *Radiata*—viz., to designate the lowest primary division of the animal kingdom, which includes many animal organisms that are fixed to a definite spot of rock, shell, &c., and have the form of plants. His zoophytes included the anomalous groups of *Infusoria*, *Entozoa*, and *Radiaria*,* the latter of

* These terms have been introduced since the time of Cuvier—*Radiaria*, we believe, by Owen; and *Bryozoa*, by Farre.

which was subdivided into the *Hydroszoa*, *Anthozoa*, *Acalephas*, *Echinodermata* and *Bryozoa*. Subsequent writers excluded the Infusoria and Entozoa from the zoophytes, and left only those constructed on the radiated type. These were afterwards found to present extreme differences of structure, and it became obvious that the lower forms of *Hydroszoa* and *Anthozoa* could not be associated with the *Bryozoa*, which approximate closely to the lower molluscs. The term is now never employed by scientific naturalists.

ZOOSPORE (Gr. *zoos*, living, and *spora*, a seed), in Botany, the name given to those Spores (q. v.), or seeds of acotyledonous plants, which being furnished with cilia, move spontaneously for a short time after being discharged from the spore-case of the parent plant. The motions of their cilia resemble those of the cilia on the Epithelium (q. v.) of the higher animals, and on the external surface of some of the lower tribes, as *Acalephas* (q. v.). In these cases in the animal kingdom, as in this case in the vegetable kingdom, there is no appearance of volition, the motion being probably owing to changes of hygrometric or of electric condition, or of both. The purpose served by the ciliary motion in zoospores, is evidently the wider diffusion of seeds; and the cessation of the motion after a certain time permits the seed to become fixed, in order to germination. Zoospores are found in *Characeae*, *Algae*, *Fungi* and *Lichens*. They have often been mistaken by observers with the microscope for animalcules. Similar to them, in the property of locomotion, simulating that of animals, is another class of bodies, also connected with the reproduction of acotyledonous plants, called *Phytosoa* (q. v.).

ZO'RANDORF, a village four English miles north of Küstrin, was the scene of the bloodiest of the many desperate conflicts of the *Seven Years' War* (q. v.). The Russians having for the second time been ordered by the Czarina Elizabeth to invade Prussia, advanced towards Berlin, committing frightful devastations, while Frederick the Great, with the bulk of his forces, was engaged with the Austrians in Silesia and Saxony. The Russians, under Fermor, were 50,000 strong, and easily drove before them Dohna's little Prussian army of 15,000; but Frederick being speedily apprised of this new invasion, hastened northwards with such a reinforcement as raised the army to 30,000; and after taking care, by the breaking down of bridges, &c., to cut off their retreat, engaged the invaders. The battle, which commenced at eight in the morning of August 25, 1758, and lasted till evening, consisted mainly in a succession of furious charges, accompanied with a tremendous artillery-fire, and was not decided till Seidlitz, by an able movement, turned the Russian flank. The Russians, now discovering that they were nearly surrounded, fought with the utmost desperation, and ultimately both armies bivouacked on the field of battle. In the morning, however, Fermor drew off his forces, diminished by 30,000 men, 108 cannon, and 27 standards; having inflicted on the Prussians a loss of 13,000 men, 26 cannon, and a few standards. Generals Soltikof, Czernitchev, and Prince Sulkowski were made prisoners by the Prussians on this occasion; and, oddly enough, the first named was the conqueror of Frederick II. in the next great battle between the two northern powers, at Kunersdorf (q. v.).

ZOROASTER, or rather Zarathustra (which in Greek and Latin was corrupted into ZARASTRADES and ZORASTRES; while the Persians and Parsees altered into ZERDUSHT), is the name of the founder of what is now known as the Parsee religion. The original meaning of the word is uncertain, and though there have been many conjectures formed about it, yet not one of them seems to be borne out by recent investigations. Most probably, it only indicates the notion of "Chief," "Senior," "High-priest," and was a common designation of a spiritual guide and head of a district or province. Indeed, the founder of Zoroastrianism is hardly ever mentioned without his family name—viz., Spitama. He seems to have been born in Bactria. The terms he applied to himself are either Manthran, i. e., a reciter of Manthras; a messenger sent by Ahuramazda; a speaker; one who listens to the voice of oracles given by the spirit of nature; one who receives sacred words from Ahuramazda through the flames. His life is completely shrouded in darkness. Both the Greek and Roman, and most of the Zend accounts about his life and works are legendary and utterly unhistorical. In the latter, he is to a great extent

represented, not as a historical, but as a dogmatical personality, vested with superhuman, or rather divine powers, standing next to God, above the archangels themselves. His temptations by the devil, whose empire is threatened by him, form the subject of many traditional reports and legends. He is represented as the abyss of all wisdom and truth, and the master of the whole living creation. "We worship"—so runs one of the prayers in *Fravardin Yasht*—"the rule and the guardian angel of Zarathustra Spitama, who first thought good thoughts, who first spoke good words, who first performed good actions, who was the first priest, the first warrior, the first cultivator of soil, the first prophet, the first who was inspired, the first who has given to mankind nature, and reality, and word, and hearing of word, and wealth, and all good things created by Mazda, which embellish reality; who first caused the wheel to turn among gods and men, who first praised the purity of the living creation and destroyed idolatry, who confessed the Zoroastrian belief in Ahuramazda, the religion of the living God against the devils. . . . Through whom the whole true and revealed word was heard, which is the life and guidance of the world. . . . Through his knowledge and speech, the waters and trees become desirous of growing; through his knowledge and speech, all beings created by the Holy Spirit are uttering words of happiness."

In the old *Yazna* (see *ZEND-AVESTA*) alone, he appears like a living reality, a man acting a great and prominent part both in the history of his country and that of mankind. His father's name seems to have been *Pourushâspa*, and that of his daughter, the only one mentioned of his children, *Ponruchieta*. Very obscure, however, remains, even by this account, the time when he lived. The dates generally given are as follows. Xanthos of Lydia places him about 600 years before the Trojan war; Aristotle and Eudoxus place him 6000 years before Plato; others again 5000 years before the Trojan war. Berosus, a Babylonian historian, makes him a Babylonian king, and the founder of a dynasty which reigned between 2200 and 3000 B.C. over Babylon. The Paracelsi place him at the time of Hystaspes, Darius's father, whom they identify with a king mentioned in the *Shâh-Nâmeh* (q. v.), from whom, however, Hystaspes is totally distinct. This account would place him at about 550 B.C. Yet there is scarcely a doubt that he must be considered to belong to a much earlier age, not later than 1000 B.C.; possibly, he was a contemporary of Moses. It is almost certain that Z. was one of the *Soshyantiôs*, or fire-priests, with whom the religious reform, which he carried out boldly, first arose. These were probably at first identical with the Vedic *Atharvans* (fire-priests), as indeed Zoroastrianism is merely an advanced stage of Brahmanism. The former creed, that of Ahura, by way of eminence, transformed, after the outbreak of the schism, the good beings of the latter into devils or devas; e. g., the purely Brahmanic *Indra*, *Sharva*, *Nâsatiya*, &c.—unless it promoted them into saints and angels (*yagatas*). The conflict that led to this schism between the Iranians and those Aryan tribes which immigrated into Hindustan Proper, and whose leaders became afterwards founders of Brahmanism, sprung from many social, political, and religious causes. The Aryans seem to have originally led a nomad life, until some of them, reaching, in the course of their migrations, lands fit for permanent settlements, settled down into agriculturists. Bactria and the parts between the Oxus and Jaxartes seem to have attracted them most. The Iranians became gradually estranged from their brother tribes, who adhered to their ancient nomad life; and by degrees, the whilom affection having turned into hatred, considered those peaceful settlements a fit prey for their depredations and inroads. The hatred thus nourished, by further degrees included all and everything belonging to these devastators; even their religion, originally identical with that of the settlers. The "Deva religion" became, in their eyes, the source of all evil. Modelled into a new form, styled the "Ahura" religion, the old elements were much more changed than was the case when Judaism became Christianity. Generation after generation further added and took away, until Zarathustra, with the energy and the clear eye that belongs to exalted leaders and founders of religions, gave to that which had originally been a mere reaction and spite against the primitive "Brahmanic" faith, a new and independent life, and forever fixed its dogmas, not a few of which have sprung from his own brains.

It is, as we said in the article on the *ZEND-AVESTA*, chiefly from the Gâthas that Zarathustra's real theology, unmutated by later ages, can be learned. His leading

idea was monotheism. Whatever may have caused the establishment of the dualism of gods, the good and the evil, in the Persian religion—a dualism so clearly marked at the time of Isaiah, that he found it necessary to protest emphatically against it—it was not Z. who proclaimed it. His dualism is of a totally different nature. It was merely the principle of his speculative philosophy—a supposition of two primeval causes of the real and the Intellectual world. His moral philosophy, on the other hand, moved in a triad—thought, word, and deed. There is no complete system of Zoroastrian philosophy to be found in the *Zand-Avesta*, any more than there is a developed Platonic system laid down explicitly in the Platonic writings; but from what is to be gathered in the documents referred to, it cannot be doubted that Z. was a deep and great thinker, far above his contemporaries, and even many of the most enlightened men of subsequent ages. If proof were needed for the high appreciation in which he was held in antiquity, it might be found in the circumstance, that even the Greeks and Romans, not particularly given to overrating foreign learning and wisdom, held him in the very highest estimation, as may be seen by their reiterated praises of the wisdom of him whose name they scarcely knew how to pronounce.

With regard, then, to the first point, his monotheism, it suffices to mention, that while the fire-priests before him, the *Soshyandâs*, worshipped a plurality of good spirits called *Ahuras*, as opposed to the Indian *devas*, he reduced this plurality to a unity. This one supreme being he called *Ahurô Mazdâô* (that *Ahura* which is *Mazdâô*), or the creator of the universe—the *Auramazda* of the cuneiform inscriptions of the Achemenidian kings, the *Aburamazd* of Sassanian times, and the *Hormazd* or *Ormuzd* of modern *Parsses*. This supreme god is by Z. conceived to be “the creator of the earthly and spiritual life, the lord of the whole universe, at whose hands are all the creatures.” The following extract from the *Gâthâ* (*Ustavârit*) will leave no doubt on that much-contested point: “Blessed is he, blessed are all men to whom the living wise God of his own command should grant those two everlasting powers (viz., immortality and wholesomeness). . . . I believe Thee, O God, to be the best thing of all, the source of light for the world. Everybody shall choose Thee as the source of light, Thee, Thee, holiest spirit *Mazdâ!* Thou createst all good things by means of the power of Thy good mind at any time, and promiseest us, who believe in Thee, a long life. I believe Thee to be the powerful holy god *Mazdâ!* for Thou givest with Thy hand, filled with helps, good to the pious man, as well as to the impious, by means of the warmth of the fire strengthening the good things. From this reason, the vigor of the good mind has fallen to my lot. . . . Who was in the beginning the father and the creator of truth? Who shewed to the sun and the stars their way? Who causes the moon to increase and wane, if not Thou? . . . Who is holding the earth and the skies above it? Who made the waters and the trees of the field? Who is in the winds and in the storms that they so quickly run? Who is the creator of the good-minded beings, Thou wise? Who made the lights of good effect and the darkness? Who made the sleep of good effect and the activity? Who made morning, noon, and night?” *Ahuramazda* is thus to Z. the light and the source of light. He is wisdom and intellect; he possesses all good things, temporal and spiritual, among them the good mind, immortality, wholesomeness, the best truth, devotion, piety, and abundance of all earthly good. All these gifts he grants to the pious man who is pure in thought, word, and deed. He rewards the good, and punishes the wicked; and all that is created, good or evil, fortune or misfortune, is his work alone.

We spoke of Z.’s philosophical dualism, and of its having often been confounded with theological dualism, which it is certainly very far from being. Nothing was further from Z.’s mind than to assume anything but one supreme being, one and indivisible. But that everlasting problem of all thinking minds—viz., the origin of evil, and its incompatibility with God’s goodness, holiness, and justice—he attempted to solve by assuming two primeval causes, which, though different, were united, and produced the world of the material things as well as that of the spirit. The one who produced the *reality* (*gayâ*) is called *Vohu Mano*, the good mind; the other, through whom the non-reality (*ayâiti*) originated, is the *Akem Manô*, the naught mind. To the first belong all good, true, and perfect things; to the second, all that is delusive, bad, wicked. These two aboriginal moving causes of the universe are called *twins*. They are spread everywhere, in God as in men. When united in *Ahuramazda* they are called *Cpentô Mainyus*, and *Angrô Mainyus*—i. e., white or holy; and dark

spirit. It is only in later writings that these two are supposed to be opposed to each other, not within Ahuramazda, but without—to stand, in fact, in the relation of God and Devil to each other. The inscriptions of Darius know but one god without any adversary whatsoever. But while the one side within him produced all that was bright and shining, all that is good and useful in nature, the other side produced all that is dark and apparently noxious. Both are as inseparable as day and night, and though opposed to each other, are indispensable for the preservation of creation. The bright spirit appears in the blazing flame, the presence of the dark is marked by the wood converted into charcoal. The one has created the light of the day, the other the darkness of night; the former awakens men to their duty, the other lulls them to sleep. Life is produced by the one, and extinguished by the other, who also, by releasing the soul from the fetters of the body, enables her to go up to immortality and everlasting life.

We have said already that the original monotheism of Z. did not last long. False interpretations, misunderstandings, changes, and corruptions crept in, and dualism was established in theology. The two principles then for the first time became two powers, hostile to each other, each ruling over a realm of his own, and constantly endeavoring to overthrow the other. This doctrine, which appears first fully developed in the *Vevidad*, once accepted by some of the most influential leaders, it soon followed that, like terrestrial rulers, each of the two powers must have a council and a court of his own. The number of councillors was six, each having to rule over some special province of creation; but Ahuramazda, who at first merely presided over this council, came gradually to be included in their number, and we then read of seven instead of the usual six *Ameshaspentas*, or immortal spirits. These six supreme councillors, who have also found their way into the Jewish tradition embodied in the *Talmud*, are both by etymology and the sense of the passages into which they figure, distinctly seen to be but abstract nouns or ideas, representing the gifts which God grants to all those who worship with a pure heart, who speak the truth, and perform good actions. The first of these angels or principles (*Vohu Mano*) is the vital faculty in all living beings of the good creation. He is the son of Ahuramazda, and penetrates the whole living good creation. By him are wrought all good deeds and words of men. The second (*Ardibehesht*) represents the blazing flame of fire, the light in luminaries, and brightness and splendor of any and every kind. He represents, as the light, the all-pervading, all-penetrating Ahuramazda's omnipresence. He is the preserver of the vitality of all life and all that is good. He thus represents Providence. The third presides over metals, and is the giver of wealth. His name is *Sharavar*, which means possession, wealth. The fourth (*Issandarmat* = Devotion) represents the earth. It is a symbol of the pious and obedient heart of the true Ahuramazda worshipper, who serves God with his body and soul. The two last (*Khordad* and *Amerdat*) preside over vegetation, and produce all kinds of fruit. But apart from the celestial council stands *Sraosha* (*Serost*) the archangel, vested with very high powers. He alone seems to have been considered a personality. He stands between God and man, the great teacher of the prophet himself. He shows the way to heaven, and pronounces judgment upon human action after death. He is, in the *Yazna*, styled the Sincere, the Beautiful, the Victorious, who protects our territories, the True, the Master of Truth. "For his splendor and beauty, for his power and victory," he is to be worshipped and invoked. "He first sang the five *Gâthas* of *Zarathustra Spitama*;" that is, he is the bearer and representative of the sacred tradition, including the sacrificial rites and the prayers. He is the protector of all creation, for "he slays the demon of Destruction, who prevents the growth of nature, and murders its life. He never slumbers, but is always awake. He guards with his drawn sword the whole world against the attacks of the demons, endowed with bodies after sunset. He has a palace of 1000 pillars, erected on the highest summit of the mountain *Alborj*. It has its own light from inside, and from outside it is decorated with stars. He walks teaching religion round about the world." In men who do not honor him by prayer, the bad mind becomes powerful, and impregnates them with sin and crime, and they shall become utterly distressed both in this life and in the life to come.

In the same manner as Ahuramazda, his counterpart, *Angrômainyus*, was in later times endowed with a council, imitated from the one just mentioned, and consisting of six devas, or devils, headed by *Angrômainyus*

himself, who is then styled *Devānam Devo* — arch-devil. The first after him is called *Ako Mano*, or Naught Mind, the original "non-reality," or evil principle of Zoroaster. He produces all bad thoughts, makes man utter bad words, and commit sin. The second place is taken by the Indian god *Indra*; the third, by *Shiva* or *Shaurva*; the fourth, by *Naonhaitya*—the collective name of the Indian *Ashuras* or *Dioscuri*; the fifth and sixth, by the two personifications of "Darkness" and "Poison." There are many *devas*, or devils, besides to be found in the *Zend-Avesta*, mostly allegorical or symbolical names of evils of all kinds. While the heavenly council is always taking measures for promoting life, the infernal council is always endeavoring to destroy it. They endeavor to spread lies and falsehoods, and altogether coincide together with their great chief, with the devil and the infernal hierarchy of the New Testament.

Thus Monotheism was in later times broken up and superseded by Dualism. But a small party, represented by the Magi, remained steadfast to the old doctrine, as opposed to that of the followers of the false interpretation or *Zend*, the *Zendiks*. In order to prove their own interpretation of Zoroaster's doctrines, they had recourse to a false and ungrammatical explanation of the term *Zervana Akarana*, which, merely meaning time without bounds, was by them pressed into an identity with the Supreme Being; whilst the passages on which the present *Deutera*, or *Parvea* priests, still rest their faulty interpretation, simply indicate that God created in the boundless time, i. e., that He is from eternity, self-existing, neither born nor created. Two intellects and two lives are further mentioned in the *Zend-Avesta*. By the former are to be understood the heavenly, spiritual wisdom, and the earthly wisdom, i. e., that which is learned by ordinary teaching and experience. The two lives are in the same manner distinguished as the bodily and the mental, i. e., body and soul. From these two lives, however, are to be distinguished the "first" and "last" lives, terms which refer to this life and the life to come. The belief in the latter, and in immortality, was one of the principal dogmas of Z., and it is held by many that it was not through Persian influence that it became a Jewish and a Christian dogma. Heaven is called the "House of Hymns," a place where angels praise God incessantly in song. It is also called the "Best Life," or Paradise. "Hell" is called the House of Destruction. It is the abode chiefly of the priests of the bad (*deva*) religion. The modern Persians call the former *Behesht*; the latter, *Duzak*. Between heaven and hell, there is a bridge of the gatherer or Judge, over which the soul of the pious passes unharned, while the wicked is precipitated from it into hell. The resurrection of the body is clearly and emphatically indicated in the *Zend-Avesta*; and it belongs, in all probability, to Z.'s original doctrine—not, as has been held by some, to later times, when it was imported into his religion by other religions. A detailed description of the resurrection and last judgment is contained in the *Bundehesh*. The same argument—the almightiness of the Creator—which is now employed to shew the possibility of the elements, dissolved and scattered as they may be, being all brought back again, and made once more to form the body to which they once belonged, is made use of there to prove the Resurrection. There is still an important element to be noticed—viz., the *Messiah*, or *Sosiosh*, from whom the Jewish and Christian notions of a *Messiah* are held, by many, to have been derived. He is to awaken the dead bodies, to restore all life destroyed by death, and to hold the last judgment. Here, again, a later period introduced a plurality, notably a Trinity. Three great prophets are also to appear when the end of the world draws nigh, respectively bearing the names of *Moon of Happy Rule*, *Anrora of Happy Rule*, and *Sosiosh*, who is supposed to be the son of *Zarathustra*, begotten in a supernatural way; and he will bring with him a new portion of *Zend-Avesta*, hitherto hidden from man. Even a superficial glance at this sketch will shew our readers what very close parallels between the Jewish and Christian notions on the one hand, and the Zoroastrian on the other, are to be drawn; but, as we have noticed under *PANSEES* (q. v.), an attentive reading of the *Zend-Avesta* reveals new and striking points of contact almost on every page.

We have in the foregoing sketch mainly followed Haug, the *facile princeps* of *Zend studies* in these days; but we have also taken into account the views of *Windischmann*, *Spiegel*, and other prominent investigators, and principally by quoting the words of the sacred sources themselves, when feasible, put our readers in a position to judge on the main points for themselves. We cannot, however, do

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better than thus briefly summarise, in conclusion, the principal doctrines of Z., as drawn from a certain speech (contained in the *Gathas*, which, in all probability, emanates from Z. himself.

"1. Everywhere in the world, a duality is to be perceived, such as the Good and the Evil, light and darkness; this life and that life, human wisdom and divine wisdom. 2. Only this life becomes a prey of death, but not that hereafter, over which the destructive spirit has no power. 3. In the universe, there are from the beginning two spirits at work, the one making life, the other destroying it. 4. Both these spirits are accompanied by intellectual powers, representing the ideas of the Platonic system on which the whole moral world rests. They cause the struggle between good and evil and all the conflicts in the world, which end in the final victory of the good principle. 5. The principal duty of man in this life is to obey the word and commandments of God. 6. Disobedience is punished with the death of the sinner. 7. Ahuramazda created the idea of the good, but is not identical with it. This idea produced the good mind, the Divine spirit working in man and nature, and devotion—the obedient heart. 8. The Divine Spirit cannot be resisted. 9. Those who obey the word of God will be free from all defects, and immortal. 10. God exercises his rule in the world through the works prompted by the Divine Spirit, who is working in man and nature. 11. Men should pray to God and worship Him. He hears the prayers of the good. 12. All men live solely through the bounty of God. 13. The soul of the pure will hereafter enjoy everlasting life; that of the wicked will have to undergo everlasting punishment—i. e., as modern Parsoo theologians explain, to the day of resurrection. 14. All creatures are Ahuramazda's. 15. He is the reality of the good mind, word, and deed." See *PARSES*, *GUERRES*, *ZEND*, *ZEND-AVESTA*, &c.

ZOSIMUS, of Constantinople, a Greek historian, who lived in the 5th c. A.D. He wrote the History of the Roman Emperors, in six books, from Augustus to 410 A.D. His style is concise, clear, and interesting. He seeks to unfold the causes of the decline of the empire, and being himself a pagan, he adduces as the chief, the neglect of the pagan religion which attended the progress of Christianity. The unsparring severity with which he assails various Christian emperors, especially Constantine, has been considered by some (e. g. Bentley) to detract from his credibility as a historian. From his own point of view, he shews a considerable degree of acuteness in his remarks. Nothing is known of his personal history.

ZOSIMUS, Pope, and successor of Innocent I., requires a brief notice on account of his connection with the history of the heresiarch Pelagius (q. v.). Z. was a Greek by birth, and was elected Bishop of Rome, March 1, 417. The African bishops had condemned the opinions of Pelagius, and this judgment had been ratified by Pope Innocent. In the interval, however, Pelagius appealed to the pope; and his disciple, Celestius, came in person to Rome, where he presented a confession of faith in his own justification. Z. having convened a council of bishops and submitted this to them, was induced by the specious explanations of Celestius to suspend the judgment, and even to write to the African bishops, recommending a reconsideration of the case. This apparent conflict of Z. with his predecessor, although it has been used by the Gallican as well as Protestant controversialists as an argument against papal infallibility, was nevertheless only temporary. On further examination of Celestius, Z. became sensible that he had been deceived; and even before the reply of the African bishops, confirmed and renewed their original condemnation of the Pelagian doctrine. He died December 26, 418. His Letters, which are curious and interesting, are found in Constant's "*Epistolæ Romanorum Pontificum*."

ZOUAVES (Arab *Zu'awa*), a body of troops in the French army, which derives its name from a tribe of Kabyles, inhabiting the mountains of Jurjura, in the Algerian province of Constantine. Long previous to the invasion of Algiers by the French, these Kabyles had been employed as hired mercenaries in the service of the rulers of Tripoli, Tunis, and Algiers; and after the conquest of the last-named country in 1830, the French, in the hope of establishing a friendly feeling between the natives and their conquerors, took the late Dey's mercenaries into their service, giving them a new organisation. Accordingly, General Clausel created, in 1830, two battalions of Z., in which each company consisted of French and Kabyles in certain proportions, officers, subalterns, and soldiers being selected from either race; the Z.,

though retaining their Moorish dress, were armed and disciplined after the European fashion; and the battalions were recruited by voluntary enlistment. As it was soon found, however, that the system of commingling the two races did not effect the object intended, the French and Kabyles were formed into separate companies; and in 1837, they were divided into three battalions, and put under the command of a colonel. Their first colonel was Lamoricière, who mainly effected their reorganisation, and under whom, as well as his successor, Cavaignac (q. v.), they distinguished themselves in many a bloody conflict with the Arabs of the south. Gradually, however, the native element was eliminated, and since 1840, they may be considered as French troops in a Moorish dress. In 1852-1855, their numbers were greatly augmented, and they now amount to upwards of 10,000 men, divided into four regiments of four battalions each. They are recruited from the veterans of the ordinary infantry regiments who are distinguished for their fine "physique" and tried courage and hardihood; clad in a loose jacket and waistcoat of dark-blue cloth ornamented with yellow braid, loose madder-colored trousers, brown cloak, madder-colored Fex cap with a yellow tassel, surrounded by a green turban, a light blue sash of wool, yellow leather leggings, and white gaiters; and armed with a carbine and sword-bayonet. The uniform of the officers and subalterns is the same as that of the hussars.

When the French and the African elements of the original Zouave battalions were separated, the Africans were constituted into a separate body, under the name of Algerian Tirailleurs, a force still recruited in Algiers to form a part (three regiments) of the regular French army. They are better known as *Turcos*.

ZSCHOKKE, Johann Heinrich Daniel, one of the most eminent German authors of this century, was born at Magdeburg on March 22, 1771. On leaving school at the age of 17, he joined a company of players in the capacity of dramatic author. He travelled with them for some time, after which he returned to his family, and entered the university of Frankfurt. There he seems to have studied all subjects from divinity to administration (*Kameralwissenschaften*). He at the same time acted as a private teacher, and published plays which brought him some reputation, but no pay. In 1795, he was disappointed in obtaining the post of Ordinary Professor, for which he applied, and set out on a tour through Germany and France. He settled finally at Reichenau, in the Grisons, where he opened a boarding-school. So much pleased were the governing bodies of the canton with his establishment, that they presented him with the citizenship. In return for this favor, he wrote a History of the Grisons, published at Zürich in 1798 (*"Geschichte des Freistaats der drei Bünde in Rhätien"*). In the same year, however, Z. became unpopular in the canton by advocating its annexation to the Helvetic Republic established by the French, and his school was in consequence closed. He removed to Aarau, then the seat of government, where he was employed as a commissioner to settle the affairs of Unterwalden, Uri, Schwyz, and Zug, a trust which he discharged with the utmost ability and good temper. The benevolent interest, indeed, which he manifested in the sufferings of the population has made his name memorable as a national benefactor. It would be tedious to enumerate the political and administrative affairs in which Z. was actively engaged after this period; we find him at one time protesting against the arbitrary proceedings of the French, and at another pointing out the prudence of concession, but always taking a course marked by practical sagacity and wisdom. In 1804, he was presented with the citizenship of Aargau and appointed Inspector of Woods and Mines. In the same year, he founded the Swiss Messenger (*"Schweizerboten"*) a publication which rapidly became popular. It was followed by the Miscellany of the Latest News (*"Miscellen für die neueste Weltkunde"*), which was continued down to 1812. In 1811, he added a monthly periodical, the *"Erfahrungen,"* to these publications. He died at Aarau, June 27, 1848. Z.'s works are very numerous, and are always characterised by a sound information, good sense, and a vigorous and effective eloquence. The most important of his historical works, not mentioned above, are *"History of the Forest Cantons,"* a *"History of Bavaria,"* a *"Popular History of Switzerland."* His novel or tales are more numerous and better known; among the best are *"The Creole,"* *"Alamoutide,"* *"Jonathan Frock,"* *"Clementine,"* *"Oswald,"* and *"Meister Jordan."* As a poet and play-writer, Z. has less merit. The most popular of all his writings was the *"Hours*

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of Devotion," a Sunday periodical: it supplied a complete exposition of modern rationalism, and yet displayed such zeal and eloquence in the cause of sound morality, that it met with approbation from persons of all creeds. It has gone through 40 German editions, and, with many other works of Z., has been translated into English. A collected edition of works of Z. (Aarau, 1825). See "Life of Zschokke," by Munch (Haag, 1831); and "Autobiography," Eng. trans. (1845).

ZSCHOPPAU, a town of Saxony, in the circle of Zwickau, and about 26 miles east of the town of that name, on the river Zschoppau. It has a castle and two churches; manufactures of hosiery, cloth, lace, &c.; weaving, wool-spinning, dyeworks, bleach-works. Pop. (1875) 8045.

ZUG, the smallest of the Swiss cantons, is about 14 miles in length by 10 in width. Pop. (1870) 20,993; (1877) 21,915. The south-eastern part of the canton borders on the Alpine region, and is hilly and pastoral; the north-western part, sloping to the plain of Switzerland, and enclosing a great part of the Lake of Zug, is a rich and beautiful country of corn-fields and orchards. The chief exports of Z. are dried fruit, cattle, and the products of the dairy. Z. is a representative democracy, all citizens above 19 enjoying the franchise. There are two councils, one consisting of 67 members, which discharges legislative functions, and another consisting of 11 members, which conducts the administration. The inhabitants speak Swiss-German, and are Roman Catholic. The battle of Morgarten, which founded the independence of Switzerland, was fought on the frontier of this canton in 1315; but it was not till 1352 that Z. joined the Swiss Confederation.—Zug, the capital of the canton, has a pop. of about 4300.

ZUIDER ZEE, a large gulf penetrating deep into the Netherlands, between 53° 28'—53° 28' N. lat., is about 60 miles in length, and 210 miles in circumference. The islands Texel, Vlieland, Ter Schelling, Ameland, and Schiermonnikoog, reaching in a chain from the most northern point of Holland, are the remains of the former line of coast, which form a breakwater against the North Sea. From Dunkirk in French Flanders to the north of Holland, the interior is defended from the sea by sand-hills or dunes. Here, as at the mouth of the Scheldt, the sand-barrier was broken, and the waters overflowing the low lands, separated the province of Friesland from the peninsula of North Holland, and, having united with the small inner lake *Flevo*, formed the present Zuider Zee. The decisive inundation occurred in 1283.

In the Z. Z. lie the islands Wieringen, Urk, Schokland, and Marken, with a pop. of about 5000 souls. Fishing is the principal industry. The light-tower, on the east point of Marken, stands in 52° 27' 57" N. lat.; and the inhabitants are a hardy, industrious, and independent people, who live by fishing and exporting meadow-hay. They cling tenaciously to their old customs, and never marry except among themselves. The houses are built on artificial mounds, or "hills of refuge;" and the island being liable to frequent and heavy floods, few cows or sheep are kept, no gardens or trees planted, the necessaries of life being almost all brought from the mainland.

From the south-east of the Z. Z., a long narrow arm, called the Y (pronounced I), formerly ran nearly due west, through the peninsula of Holland. A strong sea-dyke and locks have been constructed to cut off the Z. Z. from the Y. through which a broad ship-canal has been made between Amsterdam and the North Sea, on which a new harbor is approaching completion. On both sides of the new canal, the Y has been drained and turned into about 12,000 acres of rich land. The new waterway was formally opened by the king in 1876. It is proposed to make a dyke from the mouth of the Yssel to Enkhuizen, and drain the central part of the Z. Z., making room for 200,000 inhabitants, and adding nearly 500,000 acres to the arable land of the Netherlands.

ZU'LU, or Amazulu, is the name of that portion of the Kaffir race who inhabit Natal and the region north-east of it, until they gradually merge into the mere negro of the east coast, north of the Zambesi. The Kaffir organisation appears to hold an intermediate place between that of the negro and a higher type; and as we go on south and west, from the swamps and malaria of Delagoa Bay and Sofala to the more healthy and bracing regions of Natal and Independent Kaffraria, the Kaffir features appear, as it were, to grow more refined—the mouth protrudes less, the lips are less

thick, and the nose assimilates more to that of the European, although the distinguishing type of woolly hair may still continue.

The Z. Kaffir is a far more amiable savage than his brother the Amakosa of the Cape frontier districts. He is less warlike and predatory, more industrious, and far more willing to act in the capacity of a farm-laborer or domestic servant. In language, customs, habits, &c., although certain tribal and local differences occur, yet they may be called common to all the nation, as a Z. Kaffir has no difficulty in understanding a native of British Kaffraria; and his views of a future state, purchase of wives, &c., are pretty similar. The Z. is by nature social, light of heart, and cheerful; his affections are gentle, steady, and enduring; his passions are, however, strong, and called out when in a state of war. He is comparatively chaste; crimes which stain European or Eastern civilisation are unknown to him. He is hospitable and honest, yet greedy and stingy; he is kind to his own family, yet cruel to dumb animals; and whatever the better nature of his impulses may be, yet when his great chief commands war, he is converted into a demon. He is proud, and very easily can distinguish between an English gentleman and the loafing tribe with which too many of our colonies are afflicted. The writer of this article, by the exercise of a little kindness and firmness, has experienced the most utter devotion from individuals of the Kaffir race generally. Their reasoning powers are good, and with an improved education, a Z. rationalist might not disgrace a chair in the Sorbonne.

It is from the Z. country, however, that those terrible tyrants who so long devastated South-eastern Africa, the chiefs Chaka, Dingaan, Moselikatze, &c. issued. The training of their subjects to a peculiar mode of warfare spread desolation and havoc for many years amongst the Bejuana and other tribes of the interior, until eventually these mighty chiefs with their thousands of followers, fighting, like Homer's heroes, hand to hand, armed with stabbing assegais and shields of ox-hide, the colors of which distinguished the different regiments they were formed into, melted away with broken power into comparative insignificance before the terrible rifles of a few hundred emigrant Dutch Boers, who, in their turn, gave way to the energetic action of the British authorities (see NATAL). The Zulus, although they have very often serious intestine wars amongst themselves, have generally lived on friendly terms with the Natal colonists. That their warlike qualities have not decayed was sufficiently shewn in the war that broke out in 1879 between England and Ketchwayo (Cetewayo), the Zulu king. Within a week or two after the British forces crossed the Natal frontier, the Zulus inflicted a severe blow on the invaders by surrounding a camp at Isandula and annihilating the defenders.

A number of missionary societies of the Wesleyan, American, Norwegian, and Episcopal churches labor amongst these tribes. Considerable interest was some time ago provoked with regard to Bishop Colenso's peculiar views for the evangelising these heathens; and Colenso's Zulu was for a while almost as famous as Macanlay's New Zealander.

The Amafengu tribe, now settled along the Cape frontier, are a broken tribe of Zulus, driven far to the south-west by Chaka or Dingaan, then reduced to slavery by the Amakosa Kaffirs, and freed by Sir B. Durban in the Kaffir war of 1834—1835. The principal Z. tribes are the Amazulu, the Amabute, Amazwazi, and Amatabele. The last emigrated far northwards to the mountains which separate the basins of the Limpopo and Zambezi. It is almost impossible to give an accurate idea of the number of those tribes inhabiting south-east Africa; it has been variously estimated from half a million to two millions or more. Of the language spoken by the Z. and other Kaffir tribes, it must be observed that that in use by the Natal and Zululand Kaffirs is much more pure than that spoken by the Kaffirs on the Cape frontier, where Hottentot clicks and vulgar colonial Dutch words have got very much mixed up with it.

ZULULAND. The country lying north-east of the colony of Natal, between its east boundary, the Tugela and Unzinyati rivers, lat. $29^{\circ} 10'$ e., and Delagoa Bay, lat. 26° s., long. $32^{\circ} 40'$ e., is generally known under the name of Z., or the Zulu country, inhabited by independent tribes of Zulu Kaffirs, those living in the immediate vicinity of the Natal colony being subjects of Ketchwayo (Cetewayo), son of the once powerful chief Umpanda, and successor of the tyrants Chaka and Dingaan.

Zumala
Zutphen

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The great coast chain of mountains, which form in the Cape Colony the Stormbergen, and further to the north-east the Kahlamba and Drachenbergen, still continue well defined to the north-east, running parallel to the coast, but 120 miles distant from it, separating the coast region of Z. from the higher plateaux of the Transvaal, and rising to an average height of 6000 or 7000 feet. East of the Tugela River, the country spreads out into large undulating, grassy plains, but sparsely wooded; while towards the foot of the mountains the kloofs afford some excellent timber. The principal rivers are the Umvoluzi or St Lucia River, which enters the sea about 80 miles north-east of the Natal frontier; and the Mpopots and its branches, which drain the north part of the region, and fall into Delagoa Bay. The country along the coast between the St. Lucia River and Delagoa Bay is very flat, marshy, and unhealthy. A considerable range of mountains, called the Lebombo, run from the Umvoluzi River almost in a northerly direction to beyond Delagoa Bay, about half way between the coast and the first range we have mentioned, forming a supporting buttress to a plateau of high level, similar to those so common in the Cape Colony and Natal.

This is generally a fertile region, and, as far as the coast-line, is healthy. Sugar, cotton, and other tropical products can be grown as advantageously as in the Natal colony, to which it forms, as it were, an intermediary link between the fever-regions of the east coast and the more healthy climate of Natal and the Cape Colony. The St. Lucia River marks the boundary-line beyond which, to the north-east, Europeans cannot live. Although our traders have tolerably well explored the Zulu country, yet no good map of the region exists, and we know very little of its geology or mineral productions. None of the rivers are available for inland navigation, although a large lagoon beside the mouth of the St. Lucia River can be ascended for a few miles. The rivers which flow into Delagoa Bay from the north are sluggish streams, often with no perceptible current, and can be ascended a considerable distance. A large quantity of ivory, rhinoceros' horns, hides, &c. are collected in this region by traders from Natal; and cattle, Indian corn, &c. thrive well in the country before the swampy region commences. The principal tribes are all of the Zulu race—the Amazulu inhabiting the region bordering on Natal; the Amalute, Amaswazi, &c. the country in the neighborhood of Delagoa Bay. The Portuguese have a very decayed fort and settlement on Delagoa Bay, garrisoned by a few mulatto soldiers, and carrying on some trade with the natives and Dutch Boers in gunpowder, muskets, calico, &c., in exchange for ivory, horns, and other native produce; and a contraband one in slaves is also, we fear, winked at by the authorities, as captures are often made along the coast by our cruisers. The Dutch emigrant Boers, who very much required a port on the sea-board of South-east Africa, would long since have seized on Delagoa Bay, if it were not from a wholesome dread of the very unhealthy climate, which appears to affect those stalwart sons of the highlands of South-east Africa more even than it does Europeans or North-Americans.

ZUMALA-CARREGUY, Don Tomas, the most distinguished of the generals who supported the cause of Don Carlos during the Spanish Civil War of 1833–1840, was born in 1759 at Ormaiztegui, in the Biscayan province of Guipuzcoa. Of an aristocratic, though not wealthy family, he was deeply imbued from infancy with royalist sentiments, which gathered strength with increasing years, till they led him, like the Vendean leaders, to sacrifice fortune and life for a prince wholly unworthy of such devotion. At the time of the invasion of the Peninsula by Napoleon, Z. was a student of law at Pampeluna, and like many of the Spanish youth, he deserted his studies to take up arms against the invader, serving in Mina's corps till the close of the war. He afterwards served under Quesada, in the "Army of the Faith;" and on the re-establishment of absolutism, was raised to the rank of colonel, and appointed governor of Ferrol. He displayed excellent administrative qualities; but his decided leaning to the party of the Carlists (though he repelled indignantly all proposals to proclaim Don Carlos king during the life of Ferdinand VII.) becoming known, he was tried by a council of war, and acquitted. In 1832 when the army was purged of all officers suspected of Carlism, Z. was dismissed, and retired to Pampeluna, where he lived in retirement till the death of Ferdinand and the rising of the Basque population called him to head the Carlist insurrection (October 11, 1833). His motley army was without uniform, ill fed, and ill paid; yet the profound esteem in which "el Tio Tomas"

was held by his followers enabled him to maintain an effective discipline. The overwhelming superiority in number of the Christians, however, forced him to adopt a defensive system of tactics; so, holding the command of Biscay and Navarre, and the strongholds of Fuenterrabia and Iruu, to assure his retreat into France, if necessary, he kept his opponents at bay, defeated Roldin in the valley of Amescuas (August 1, 1834), routed another force of Christians at Viana (September 7), gained a second victory in the Amescuas Valley in the following spring, completely defeating Valdez, after a battle of four days, and routed Iriarte near Guernica. These brilliant successes of his skilful and devoted partisan flattered the too sanguine and somewhat weak-minded Don Carlos with the hope of speedily seating himself on the throne, rendered him less willing than formerly to be guided by the counsels of Z., and led him to interfere with the latter's schemes, to his own detriment. Accordingly, after another year's successful fighting with the Christians, Z. was ordered to lay siege to Bilbao; but on June 15, 1835, he received a gun-shot wound so severe that he died ten days afterwards. With Z.'s death, all hope of success for the Carlists was extinguished; and though the war dragged on desultorily for some years longer, the result was never doubtful. Z. was as distinguished for generosity and disinterestedness as for fidelity; and so much had he impoverished himself by liberality to his soldiers, that neither his wardrobe nor his treasury supplied the means for his decent interment.—See Henningsen's "Twelve Months' Campaign with Zumala-Carreguy in Navarre and the Basque Provinces" (2 vols., Lond. 1836).

ZÜRICH, a canton on the north-eastern frontier of Switzerland, is drained by the Rhine and its tributaries. Pop. (1870) 234,786 (1877) 296,815. It is traversed by ridges of lofty hills, running north-west and south-east, between which lie three valleys, forming almost its whole surface—those of the Toos, the Glatt, and the Limmat. The Lake of Zürich penetrates Z. for a distance of 26 miles, and connects it with the cantons of Schwyz and St Gall. Z. has not a fertile soil, but it is carefully cultivated. A considerable quantity of corn is raised in the canton, though not enough to supply the wants of the population. Vineyards and orchards are numerous; but the pasture-lands are of much greater importance, and cattle form the chief wealth of the agricultural population. Z. was one of the earliest seats of the cotton manufacture in Europe, and the spinning and weaving of cotton are still prosecuted with great success. The silk manufactures are nearly as important; and more recently, the progress made in the manufacture of railway locomotives and other machinery, has been a cause of some alarm to English engineers. The mechanics of Z. divide their attention between agriculture and manufacturing industry, and are among the most prosperous and best educated working-men in Europe. The government of the canton is a representative democracy—all adult citizens of 20 enjoying the franchise. The great council of Z. is elected chiefly by the citizens, but partly also by its own members. It appoints for four years an executive council of nine members. A desire to give a yet more thoroughly democratic character to the constitution led to the appointment in 1868 of a committee to consider its revision; and now the real decision as to laws, taxes, &c., lies with the people. Z. returns 14 members to the national council. The pop. of the canton (668 sq. m.) is German-speaking and Protestant.

ZÜRICH, the capital of the canton of the same name, is situated at the point where the Limmat issues from the Lake of Zürich, and unites with its tributary, the Sihl. Its pop. in 1870 was 21,199. It is one of the most prosperous manufacturing and commercial towns of Switzerland; yet the narrow streets and lofty houses of its older quarters, on the high ground east of the river, give it the quaint appearance of a mediæval city. There are many interesting old buildings—the most remarkable being the cathedral, erected in the 11th century. The university, the gymnasium, and the school of industry have long enjoyed a high reputation. The town library is extensive; and numerous museums of natural history, &c., indicate the intelligence and cultivated tastes of the population.

ZU'RUMA, or Zaruma, a town of Ecuador, South America, on the west slope of the Andes, about 80 miles from the west coast, and 90 south of Guayaquil. It is situated in a mining district—its gold and silver mines having rendered it formerly very populous, but its importance has greatly declined. Pop. about 6000.

ZU'TPHEN, a fortified town in the Netherlands, province of Gelderland, is beau-

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Zwingli

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tifully situated on the right bank of the Yssel, where that river is joined by the Berkel, in a picturesque district of country, chiefly under cultivation, and variegated with abundance of wood. It is one of the oldest towns of the kingdom, but has many elegant modern buildings. The fortifications are promenades, from many points of which lovely prospects are obtained.

Z. is a station of the State Railway from Arnhem to Friesland, and has an extensive trade in wood, bark, and grain. There are factories for weaving and spinning, grain, wool, oil, and paper mills, many tanneries, a soap-boiling establishment, and a large carpet-manufactory. The principal building is the Great Church, supposed to have been founded in 1108; it and the Broederenkerk (Church of the Brethren) belong to the Reformed Communion; the Roman Catholics, Lutherans, and Baptists have each a church, and the Jews a synagogue. Besides good schools for the ordinary branches of education, there are a grammar-school, school of design, a theatre, and a concert-hall. The town has several charitable institutions for the sick, orphans, and old people; also the provincial lunatic asylum, which can receive 220 patients. Pop. (Jan. 1, 1875) 14,421.

At Rysselt, a village near Z., is a reformatory, called the Netherlands Metray, in which about 150 boys are educated, and taught farm-labor, and various handicrafts. It was founded in 1851, and has done much good. Nearly one-half of the boys have been withdrawn by their parents. The others obtain situations through the directors. The largest number have taken to farm-labor and gardening, for which the reformatory specially prepares them. Many have become soldiers and sailors; others smiths, house-painters, shoemakers, tailors, bakers, bricklayers, house-servants, &c. The institution is maintained by annual contributions, legacies, and a small charge for each boy. The receipts are about £3500 annually, of which, on an average, a half is from legacies and contributions. The expenditure is about the same.

ZVENIGORO'DKA, an old town of Russia, government of Kiev, on the Ttkritch, a tributary of the Bug, about 98 miles south of the town of Kiev. Pop. 11,200. The trade and manufactures are not worthy of notice.

ZVO'RNİK, a town of Bosnia, which the Austrians, now administering Bosnia, occupied in 1878 only after severe fighting, is on the Drina, about 60 miles n. e. of Bosna-Seral. The town is strongly fortified, standing on the face of a steep hill, at the summit of which is a strong fortress commanding the valley of the Drina. It has several mosques, Greek and Roman Catholic churches, lead mines, and a considerable trade in timber. Pop. about 12,000.

ZWEI'BRÜCKEN. See *DEUX-PONTS*.

ZWICKAU, a picturesque, irregularly-built, ancient-looking town of Saxony, in a pleasant valley on the left bank of the Mulde, 60 miles south-west of Dresden. The river is crossed here by three bridges. The town is the capital of the circle of Zwickau, and is the seat of a district court, court of appeal, and other public offices. Of its churches, the most noteworthy is that of St Mary, the finest Gothic edifice in the Erzgebirge, dating from 1458, distinguished by its tall tower, from which an extensive view can be obtained; it contains a very fine altar-piece by the old German master Wohlgemuth, and other interesting works of art. There are also a splendid court-house and exchange; a cloth hall, a district infirmary; a gymnasium, with a library of 30,000 vols., a burgher, Catholic, trade, and other schools; an old castle, which has been converted into a workhouse. The town is prosperous, and the population increasing. There are cloth, manufactories, breweries, dye-works, chemical works, tanneries, oil and saw mills. The chief source of its wealth, however, and that of the neighboring villages, are the rich beds of coal in the surrounding district. There are also large iron-works in the neighborhood. The town is connected by railway with Leipzig, Dresden, and other important places, and has a considerable transit trade. Pop. (1875) 81,491.

ZWINGLI, Ulrich, one of the most important of the reformers, was born 1st January, 1484, at Wildhaus, in the canton of St. Gall, Switzerland, and was one of eight sons of the ammann of that place. He studied first at Bern; then at the

University of Vienna, where he devoted himself to philosophy; and afterwards at Basel, where, under Wyttenbach, he directed his attention to theology. He became pastor in 1506 in Glarus. At this time, his studies were chiefly directed to the Latin classics and the church Fathers; but having begun to learn Greek in 1518, he from that time devoted himself to the New Testament. He wrote out the Epistles of Paul in the original language, and learned them by heart, which was of great service to him afterwards in his disputations. In the capacity of army chaplain, he attended the campaigns in Lombardy of the inhabitants of Glarus for the pope against the French, in 1512, 1513, and 1515, for which service he received a pension from the pope till 1517. In 1516, the liberal-minded administrator, Geroldseck, invited him to be preacher in the convent of Maria-Einsiedeln, famous for its pilgrimages. Here Z. began to preach against many abuses prevailing in the church; he also called on the bishops of Sitten and Constance to besir themselves for the improvement of the church under the guidance of the Word of God. So little was he then suspected, that the papal legate, Antonia Pulci, conferred on him, in 1518, the diploma of chaplain to the Holy See. He was soon afterwards called to Zürich; and he entered on his office as pastor in the great cathedral there, 1st January, 1519, with a discourse, in which he declared himself for the pure gospel unfettered by glosses. In this office, to which was joined in 1521 that of canon of the cathedral, he laid the foundation of his subsequent work as reformer. The same cause that had stirred Luther into activity gave the impulse to Zwingli. In 1518, Bernardin Samson, a Franciscan from Milan, came to Switzerland for the purpose of selling indulgences for the benefit of the papal court. Z., who was still in Einsiedeln on Samson's first appearance, opposed him both there and afterwards in Zurich with the whole force of his pulpit eloquence, and succeeded so well that Samson was not allowed to enter the town of Zurich. From this time Z., although attacked by the monks and many of his brother canons, advanced with rapid steps in his reforming career; for the magistracy of Zurich supported his measures to such a degree that, as early as 1520, they issued an order throughout their jurisdiction that the Word of God should be taught without human additions. In 1522, the Reformation was formally established in Zurich. At this time, Z. wrote his first book against the fasts of the Roman Church; he also began to study the Hebrew language. The offers of high promotion made to him by Adrian VI. could not make him waver. In January 1523, the government of Zurich invited all theologians disposed to enter the lists with Z. to a conference at Zurich, which was attended by 600 clergy and laity. Z. had arranged the articles of faith, to the number of 67, which were to be the subject of the conference, and defended them so ably against the attacks of the celebrated Joh. Faber, afterwards Bishop of Vienna, that the council of Zurich declared in favor of Z.'s doctrines, and upheld him and his assistants in adhering to them. The second disputation, October 1523, at which Z., before more than 900 people, spoke against the worship of images and the mass, was the cause of the removal of all pictures and statues from the churches of the city of Zurich and its jurisdiction; and this was followed, in 1524, by the abolition of the mass. In the same year, Z. entered into the married state with Anna Rheinhard, aged 43, the widow of a nobleman of the name of Meyer von Knouow. In the following year, he published his creed, "Von der wahren und falschen Religion" (Of the True and False Religion). He had thus, in a few years, placed the work of reformation in his native land on a solid footing. He now pressed zealously forward in the same course; while the magistracy of Zurich, who all along actively supported him, abolished the begging friars, brought matters relating to marriage before the secular courts, and instituted a better management of church property. On a great many points, Z. was at one with Luther and the other German reformers; only, in regard to liturgical matters, he carried out his reform more radically according to the Bible, and rejected the dogma of the presence of Christ in the Lord's Supper. In order to heal the breach that had, as early as 1524, broken out between the two parties of the new religion on the latter point, a meeting between the Saxon and Swiss reformers was brought about by Philip, Landgrave of Hesse, at Marburg, in 1529. The conference lasted for three days, but little progress was made towards unity of opinion. See SACRAMENTARIAN. In 1531, open war broke out between Zurich on the one side, and the Catholic cantons of Lucerne, Schwyz, Uri, Unterwalden, and Zug on the other; and Z., by

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Zymosis

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command of the council of Zurich, had to take the field with the banner of the canton, which had always been borne by a priest. On the 11th October came the conflict; and as their opponents were more than double in number, and also better led, the Zurichers were beaten, and Z. was among the fallen. His collected works were published in Zurich in 1445, in 4 vols.; a selection, in two vols., appeared in 1819-1821, edited by Usteri and Vögeli.—See Rotermund, "*Z.'s Leben*" (Brem. 1818); Hottinger, "*Huldr. Z. und Seine Zeit* (Zur. 1843).

Of all the reformers, there are none more fitted to excite our love and respect than Zwingle. Fearlessly honest in purpose; with a clear head and eye for the truth; less violent, if less eloquent than Luther; more candid and open-minded, if less systematic and penetrating in spiritual insight than Calvin; he stands before us quite as original, if not as prominent as these reformers. His work was not so great as theirs, his influence not so extended; but his character was quite as genuine, and his labor, in some respects, quite as enduring.

ZWO'LLÉ, the capital of the Netherlands province of Overijssel, is situated on the Zwarte Water, and by the canal called the Willemvaart has connection with the Yssel. It is one of the finest towns in the kingdom, having many beautiful private and public buildings. Both within and without the gates are pleasant promenades and drives, shaded by large trees. The surrounding country consists of rich meadows and cultivated fields, adorned by pretty country-seats. Z. has three extensive suburbs—Diezenpoorten, Kamperpoorten, and Sassepooorten. It is most favorably situated for commerce, having, by navigable waters and railways, communication with the provinces around the Zuider Zee, Hanover, England, and other maritime nations. The trade in farm-produce and stock is very great. Principal industries are shipbuilding, tanning leather, rope-spinning, beer-brewing, soap-boiling, weaving calicoes and stockings, book and plate printing, making salt, cooperage, and refining sugar. The most important buildings are the Town House, Palace of Justice, and Great Church. There are many excellent charitable institutions; and besides those for the ordinary branches of education, a flourishing grammar-school, in which Pope Adrian VI. was partly educated, and a school of design. Z. has a cabinet of natural history, a library and a musical society. Here the poet Rhynvis Felth (1753-1834) was born, and Thomas à Kempis lived during 11 years. Between 1816 and 1876, the pop. increased from 12,870 to 21,310.

ZYGODACTYLA (Gr. yoke-footed), a name given by some naturalists to a section of *Pachydermata*, distinguished by having two principal hoofs upon which the animals walk, so that the foot resembles that of the *Ruminantia*. This section includes only one family, the *Suidæ*.—The term ZYGODACTYLOUS BIRDS is often applied, in Ornithology, to those birds which have the toes in pairs, two before and two behind, as most of the *Scansores*, or Climbers (q. v.).

ZYGOPHYLLACEÆ, a natural order of exogenous plants, allied to *Rubiaceæ*, and containing about one hundred known species, herbaceous plants, shrubs, and trees, chiefly natives of subtropical countries. They have opposite, generally pinnated leaves, without stipules. The flowers are solitary, or two or three together; the calyx 4-5-parted; the petals alternate with the calycine segments, and clawed; the stamens twice as many as the petals, generally rising from the back of small hypogynous scales; the ovary simple, 2-5-celled, with two or more ovules in each cell. The fruit is capsular, rarely somewhat fleshy, with four or five angles or wings. The most important genus is *Guaiacum* (q. v.). The abundance of species of *Zygophyllum* and some other genera constituted one of the most striking features of North African and Arabian deserts. The flowers of *Z. sabago* are employed as a substitute for capers, under the name of *Bean-capers*. Those of *Melanthus major*, a native of the Cape of Good Hope, abound so much in honey, that it is obtained from them for use by merely shaking the branches. The Turks use the seeds of *Peganum harmala* both as a spice and for dyeing red.

ZYMO'TIC DISEASES have been already referred to, and the most important of them are mentioned in the article *Nosology*. The class of diseases to which Dr. Farr has assigned this now generally accepted term, comprises those which are *epidemic*, *endemic*, and *contagious*, as, for example, *fever*, *small-pox*, *plague*, *influenza*, *cholera*, *hooping-cough*, &c. As Dr. Farr observes: "The diseases of this class distinguish one country from another, or one year from another; they have formed

epochs in chronology; and as Niebuhr has shewn, have influenced not only the fate of cities, such as Athens and Florence, but of empires; they decimate armies and disable fleets; they take the lives of criminals that justice has not condemned; they redouble the dangers of crowded hospitals; they infest the habitations of the poor, and strike the artisan in his strength down from comfort into helpless poverty; they carry away the infant from the mother's breast, and the old man at the end of life; but their direct eruptions are excessively fatal to men in the prime and vigor of age. They are emphatically called the *morbi populares*." It must not be assumed, as the origin of the word (*zymē*, the Gr. for a ferment) might lead the reader to infer, that all the so-called zymotic diseases are true fermentations, for the class is intended to comprehend all the principal diseases which have prevailed as *epidemics* or *endemics*, and all those which are *communicable either by human contact or by animals in a state of disease*, as well as the diseases that result from the *scarcity and the deterioration of the necessary kinds of food*, or from *parasitic animals*. The diseases of this class thus arrange themselves into the four orders of *Miasmatic*, *Enthetic*, *Distic*, and *Parasitic* disorders, of which *fever*, *syphilis*, *scurvy*, and *worms* may be regarded as the types.

Dr Carpenter, in a Memoir on "The Predisposing Causes of Epidemics," shews that the conditions which give rise to zymotic diseases may be referred to the three following categories: (1.) Conditions which tend to introduce into the system decomposing matter that has been generated in some external source, as, for example, putrescent food, water contaminated by sewage, or other decomposing matters and air charged with miasmatic emanations. (2.) Conditions which occasion an increased production of decomposing matter in the system itself. The best example of this class of conditions is afforded in the puerperal state (or childbed), in which the tissue of the womb is undergoing rapid disintegration, and the decomposing matters which would be harmless at other times, are now able to act upon the blood of the woman, so as to induce that most fatal of all the zymotic diseases, puerperal fever. (3.) Conditions which obstruct the elimination of the decomposing matter normally or excessively generated within the system, or abnormally introduced into it from without. For example, any obstacle to the elimination of urea or uric acid, carbonic acid, biliary matters, lactic acid, &c., gives rise to as true poisoning as if these substances had been injected into the blood-vessels. The most important of the laws by which zymotic poisons are governed, are noticed in the article *VIRUS*.

The average annual rate of mortality in this country at the present time is nearly 22 per 1000, or 1 in 45 of the population; and the deaths from zymotic diseases vary from 21 to 26 per cent. (or amount to nearly one-fourth) of the total number of deaths. Taken in order of their greatest fatality they would be thus arranged: cholera, typhus and other forms of continued fever, scarlatina, hooping-cough, measles, croup, small-pox, dysentery, and erysipelas—the other diseases being less fatal.—For further information on the subject of this article, the reader is referred to Aitken's "Science and Practice of Medicine."

INDEX

OF MATTERS NOT HAVING SPECIAL ARTICLES.

It has been thought unnecessary to repeat in the Index the titles of the 27,000 articles composing the body of the work. Any person consulting the Encyclopædia is supposed, in the first instance, to look for the subject he is in quest of in its proper alphabetical place. If it is not to be found there, by turning to the Index he is likely to get a reference to it under another name, or as coming in for notice in connection with some other subject. It frequently happens that subjects, having articles of their own, are further noticed under other heads; and where it seemed of importance, a reference is given in the Index to this additional information. The subject is printed second, the information sought first, in this Index.

ABBREVIATIONS: r., river; L., lake; mt., mountain; I., island; c., cape.

Aa, Ems.
Aabenrade Flord, Slesvig.
Aach, Aa.
Aachen, Aix-la-Chapelle.
Aahnes, Egypt.
Aar, Nassau.
Aarau, Aargau.
Aath, Ath.
Aatholm, Lanland.
Ababde, Nubia.
Abaci, Plantain.
Abaco, Bahamas.
Abai, Abyssinia, Nile.
Abana, Barrada, Syria.
Abanz, Guiana, British.
Abateinhu, Tembu.
Abbasides, Abbas, Calif.
Abbate, Abbé.
Abba Yared (mt.), Africa.
Abbey Craig, Clackmannansh.
Abbot of Unreacou, Foals, Feast of.
Abbotsford Club, Roxb. Club.
Abdalla, Wahabia.
Abd-el-Aziz, Spain.
Abdelmoumen, Almohades.
Abderrahman, Omniades.
Abd-n-Aziz, Ot. Emp.
Abd-n-Aziz, Wahabia.
Abd ul-Hamid, Ot. Emp.
Abd-ul-Medjid, Ot. Emp.
Abdulmelek, Omniades.
Abecedar an Hymus, Acrostic.
Abel, Algebra.
Aella, Avella.

Aberbrothwick, Arbroath.
Aberche (r.), Tagus.
Aberconway, Conway.
Abercorn, Lords of. Hamilton Family.
Aberdare, Cardiff, Merthyr-Tydvil.
Aberdeen, Earls of, Gordon Family.
Aberffraw, Anglesey.
Abergele, Denbighshire.
Abernouddu, Brecon.
Abertaw, Swansea.
Abingdon (I.), Galapagos Is.
Adjuration of the realm, Sanctuary.
Abolitionists, Republican.
Aoomasus, Ruminantia.
Abomey, Dahomey.
Abou Arish, Yemen.
Aboyne, Dee.
Aboyne, Earls of, Gordon Family.
Abroma, Byttneriaceæ.
Absalon, Axc.
Absinthe, Liqueur.
Astraction, Generausion.
Abu, Elephantine.
Abnbekr-ibu-Tofail, Arabian Lang. & Lit.
Abu-Hanusa, Ithia.
Abu-Jafar, Calif.
Auu-Auons, Calif.
Abul-A'la, Arab. Lang. & Lit.
Abul-Aswad-al-Du'li, Arab. Lang. & Lit.
Abu'l-Farni, Anthology.
Abul-Hassan-Ali, Arab. Lang. & Lit.

Abul-Kasem, Arab. Lang. & Lit., Dis-
tillation.
Abinna, Abyssinia.
Abury, Avebury.
Abu Said, Karmathians.
Abu Tahir, Karmathians, Persian
Lang. & Lit.
Abyla, Ceute.
Acacia, false or thorn, Robinia.
Acacia formosa, Babicu.
Acacia, German, Sloc.
Academy, Royal, Painting.
Acadia, Annapolis.
Acantnopia, Adder, Viperidae.
Acanthosoma, Bug.
Accent (in verse), Rhythm.
Acceptor, Bill of Ex.
Accipenser, Sturgeon.
Accipiter, Sparrow-hawk.
Accommodation bill, Bill of Exchange.
Acephalocyst, Hydatid.
Aceria, Ruffa.
Acetone, Synthesis.
Acetum cantharidis, Vesicanta.
Ach, An.
Achæan League, Achala.
Acheen, Aicheen, Sumatra.
Acheron, Albania.
Acherusia (l.), Cocytus.
Achens, Sloth.
Achievement, Hatchment.
Achinduin Castle, Lismore.
Achlamydeous, Apetalous, Flower.
Achlya, Age.
Achmet I., II.; III., Ot. Emp.
Achmet (vizier), Ot. Em.
Achlorion, Parasitic Diseases.
Achradina, Syracuse.
Achray (l.), Katrine (l.).
Acid, Chemistry.
Acid tartrate, Tartaric Acid.
Acidulated drops, Tartaric Acid.
Acidulous waters, Carbonated Waters.
Acne rosacea, Rosacea.
Aconagua, Andes.
Aconagua, San Felipe de Aconagua.
Acoono Coono, Calabar.
Acquila, Potomac.
Acra, Jerusalem.
Acrita, Zoology.
Acroceraulian promontory, Albania.
Acromion, Scapula.
Actinia, Anemone, Sea.
Actinocrinites, Silurian Rocks.
Actinophrya, Rhizopoda.
Actilia, Sandpiper.
Acuyori wood, Ica.
Adamantine spar, Corundum.
Adam de la Hale, Opera.
Adampore, Allahabad.
Adams (mt.), Washington (ter.)

Adams (mt.), White Mts.
Adanara (l.), Solor Is., Timor.
Adassi, Black Sea.
Addax, Antelope.
Adder, Viper.
Adder, (r.), Tweed.
Adder's tongue, Ophioglossæ.
Addison's disease, Suprarenal Capsules
Addressed, Indorsed.
Address, forms of, Forms of Address
Adelaide (r.), S. Australia.
Adenanthera, Red Wood, Sandal-wood
Aderhaijan, Azerbaijan.
Adhesiveness, Phrenology.
Adl, Navarre.
Adiabén, Assyria.
Adighé, Circassians.
Adipose fin, Salmonidae
Adirya, Varun'a.
Adjudications, Register of, Registra-
tion of Deeds and Writs.
Adjutage, Hydrodynamica.
Admiral, War Service
Admiralty, Board of Admiral.
Ado-sé, Abassé.
Adowa, Abyssinia.
Adoxa, Arabia.
Adpar, Cardiganshire.
Adranum, Aderno.
Adranum, battle of Timolcon.
Adrogation, Adoption.
Adulteration of food, Food and Drink
Adur (r.), Sussex.
Adventure, Joint Trade.
Ædesius, Axum.
Æetes, Argonauts.
Ægida, Cupo d'Istria.
Æglops, Wheat.
Ælia Capitolina, Jews.
Æmilian Provinces, Emilian Provinces.
Æuarla, Ischia.
Ængermund, Angermundland.
Ænone, Ægina.
Æolipile, Steam-engine.
Æolus (l.), Ulysses.
Æqui, Volsci.
Æroïtes, Aero-siderites, Meteors.
Ærugo nobilis, Acanthia.
Æschynite, Titanium.
Æschynomene aspera, Shola.
Æsculus, Horse-chestnut.
Æsernia, Isernia.
Æthling, Anglo-Saxons.
Ælius, Ait'la, Rome, Valentianus.
Æffective faculties, Phrenology.
Æfinity, Consanguinity.
Æfronté, Abassé.
Æfrican hair, Chamærops.
Æfrican Society, the, Africa.
Æfter-birth, Placenta.
Æfter-glow, Twilight.

Agallochium, Aloes Wood.
 Aga Mohammed, Persia.
 Aguric, Fly, Amanita.
 Agaricon, Amadou.
 Agnelus, Sculpture.
 Agave vivipara, Razor-strop.
 Agbatana, Ecbatana.
 Ags, Golden, Silver, &c., Agva.
 Agriadas, Sculpture.
 Age of Bronze, Iron, &c., Bronze (Age of).
 Age of Reason, Paine.
 Agzerbuns, Christiania.
 Agglutinate languages, Philology.
 Agila wood, Aloes Wood.
 Agincourt, Azincourt.
 Aglabites, Barbary.
 Aglar, Aquileja.
 Agnew, Sir And. Sabbath.
 Agnomen, Name.
 Agows, Abyssinia, Africa.
 Agri, Basilicata.
 Agriculture, Board of, Agricultural Societies.
 Agridagh, Anatolia.
 Agri Decumates, Alemanni.
 Agroatis, Bent Grass.
 Aguan, Honduras.
 Aguará dogs, Duscicon.
 Aguará fox, Cordocoyou.
 Aguaré, Carlos, San.
 Ague-cake, Spleen.
 Aharon, Arabian Lang. & Lit.
 Ahuramazda, Zoroaster.
 Ai, Sloth.
 Aichstätt, Eichstadt.
 Aldau, Scotland.
 Aiguebellette (l.), Savoy.
 Aiguillon, Bay of, Vendée, La.
 Aiguise, Abaisée.
 Aigun, Sakhalin.
 Aïé, Abaisée.
 Ailurus fulgens, Panda.
 Alme, Dartmoor.
 Ain-esli-Shems, Bothshemesh.
 Alou, Cook Is.
 Air, Sanitary Science.
 Air-cells, Respiration.
 Aird, Ard.
 Aire (r.), Yorkshire.
 Air martyrs, Pillar Saints.
 Alton, Casuarina.
 Aix, Aa.
 Aizanes, Axum.
 Aizoon, Tetragulaceae.
 Ajuga, Bugle.
 Akabah, Gulf of, Edom, Red Sea.
 Akáits, Sikhs.
 Akals, Druses.
 Akaroa, New Zealand.
 Akenium, Achenium.

Akephaloi, Monophysites.
 Akhrida, Albania.
 Akinesia, Paralysis.
 Akleka, Akhalzikh.
 Akkad, Assyria.
 Aktistetoi, Monophysites.
 Akregne, Agrigentum.
 Akshidide, Egypt.
 Aksu, Turkestan.
 Ake, Papilionaceae.
 Alagon (r.), Tngus.
 Al Ajb, Mohammedanism.
 Ala-Kul (l.), Semipalatinsk.
 Alalia, Aphasia.
 Alamandine ruby, Spinel.
 Alamo, massacre of the, San Antonio.
 Alan, Stewart Family.
 Ala-nor, Hwang-ho.
 Alanus ab Insulis, Scholastica.
 Alas (mt.), Timor.
 Alasau (r.), Nucha.
 Al-Aswad, Mohammedan Sects.
 Alausa, Shad.
 Alb (mts.), Alp.
 Alb (r.), Rhine.
 Albn, Avezzano.
 Albacete, Murcia.
 Albacore, or Albicore, Tunny.
 Alba Julia, Akjerimanu.
 Albania, Aubagne.
 Albanie Pylæ, Derbend.
 Alban Lake, Albano.
 Albanus (mt.), Albano.
 Albany, dukes of, Stewart Family.
 Albassau, El-Bassan.
 Albuten, Arabian Lang. & Lit.
 Albemarle (l.), Galapagos Islands, Roanoke.
 Albert (r.), Australian Explorations.
 Albert and Albertine Line, Saxony.
 Alberti, Engraving.
 Albertville, Savoy.
 Albiola, battle of, Venice.
 Albion and Albiones, Albany.
 Albiruni, Arabian Lang. & Lit.
 Albia, Elbe.
 Albucasis, Medicine, Hist. of.
 Albny, New South Wales.
 Alcahest, Alchemy.
 Alcaic verse, Alcaeus.
 Alcarnenes, Sculpture.
 Alcantara (r.), Etua.
 Alcazarquebir, battle of, Sebastianistas.
 Alekmer, Hureck van, Reynard the Fox.
 Alcmeon, Anatomy.
 Alcoholism, Delirium Tremens.
 Alcoholometer, Areometer.
 Alcohol, physiological and poisonous action of.
 Alcorn Bark, Malpighiaceae.

- Alcorrunz (mt.), *Navarro*.
 Alcyone, *Peladea*.
 Alcyonella, *Alcyonium*.
 Alcyonidium, *Alcyonium*.
 Aidan (r.), *Leza*.
 Aidan (mts.), *Altal*.
 Al-Dhikr, *Koran*.
 Ale-coat, *Costmary*.
 Alector, *America*.
 Alectromauca, *Cock*.
 Aleksaudri, *Alexandra, V.*
 Aleman, *Spanish Lang. & Lit.*
 Aleppi, *Aulupolay*.
 Ales, *Colophon*.
 Alexander, *Paris*.
 Alexander, Prince, *Russian Lang. & Lit.*
 Alexandria, *Aleutian I-lands*.
 Alexandria (I.), *Victoria L.*
 Alexius II., III., IV., V., *Byzantine Empire*.
 Alfurabi, *Arabian Lang. & Lit.*
 Alfors, *Papua*.
 Alfonsine tables, *Alfonso X.*
 Alfrie, *Aofrie*.
 Algaroba, *Carob*.
 Algarobia, *Mesquite*.
 Algau Alps, *Tyrol*.
 Algazel, *Oryx*.
 Algeisrah, *Bagdad*.
 Algeisras, *Gibraltar*.
 Alghazali, *Arabian Lang. & Lit.*
 Algum tree, *Almog Tree*.
 Alhagi, *Camel's Thorn*.
 Al-Hakem, *Omniaades*.
 Alaska, *Alaska*.
 Ali-ben-Abbas, *Arab. Lang. & Lit.*
 Alice Holt, *Hampshire*.
 Allicudi, *Lipari*.
 Alife, *Piedimonte*.
 Alimentiveness, *Phrenol*.
 Alise, *Alösa*.
 Al-Jauhari, *Arabian Lang. & Lit.*
 Al-Jesira, *Mesopotamia*.
 Alkali, fossil, &c., *Sodium*.
 Alkali, volatile, *Ammonia*.
 Alkali, white, *Soda*.
 Alkaline waters, *Mineral Waters*.
 Alkanna red, *Alkanet*.
 Alkarsine, *Cacodyle*.
 Alkendi, *Arabian Lang. & Lit.*
 Alla capella, *Alla Breve*.
 Alla-ed-din Kalkobad, *Othman*.
 Allan (r.), *Cornwall*.
 Allan Water, *Bogau*.
 Allay, *Alloy (Law)*.
 Alle, *Pregel*.
 All-gretto, *Tempo*.
 Allen-heads, *Northumberland*.
 Allen Hill, *Kildare*.
 Allen (I.), *Shannon*.
 Allen (r.), *Truro*.
 Aller (r.), *Cellä*.
 All-Hallows, *All Saints' Day*.
 Alligator tortoise, *Emys*.
 Allobrogum, *Aix*.
 Alloxan, *Murexide, Uric Acid*.
 Alloxanthin, *Murexide*.
 All Saints' Wood, *Brazil Wood*.
 Alletadt, *Saxe-Weimar-Eisenach*.
 Alma Dagh (mt.), *Syria*.
 Al-Madalu, *Ctesiphon*.
 Almahera, *Gilolo*.
 Al-Mamun, *Arabian Lang. & Lit., Calif.*
 Almanea, *Murcia*.
 Almanzora, *Granada, Spain*.
 Almazarron, *Mazarron*.
 Almelo, *Overysel*.
 Almeria (r.), *Granada, Spain*.
 Almery, *Amby*.
 Almogaver, *Juan Boscan, Spanish Lang. & Lit.*
 Al-Mokanna, *Mohammedan Sects*.
 Almond, *Forth, Linlithgow*.
 Almorau, *Kumaon*.
 Al-Moshaf, *Koran*.
 Alne (r.), *Northumberland*.
 Aloe, *American, Agave*.
 Aloetin, *Dye-stuffa*.
 Aloexylon, *Aloes Wood*.
 Alopecia circumscripta, *Tinea*.
 Alori, *Ilori*.
 Alosa tyrannus, *Alewife*.
 Alp-tragus, *Arabian Lang. & Lit.*
 Alpha, *A*.
 Alphorn, *Kuh-horn*.
 Alpine crow, *Chocard*.
 Alpine warbler, *Hedge-sparrow*.
 Alsace-Zabern, *Zabern*.
 Al Sirat, *Mohammedanism*.
 Alsodex, *Violacæ*.
 Alsophilla gigantea, *Tree Fern*.
 Als Sund, *Düppel*.
 Alsted, J. H., *Encyclopædia*.
 Altamaha, *Ockmulgee*.
 Althea frutex, *Hibiscus*.
 Althing, *Iceland*.
 Althorp, *Lord, Spencer*.
 Altkirch, *Rhin, Haut*.
 Altmeyer, *Belgium*.
 Altmühl, *Bavaria*.
 Alto-Douro, *Tras-os-montes*.
 Altdöding, *Alten-Ötting*.
 Altoviscar, *Navarre*.
 Alt (r.), *Transylvania*.
 Aluknunda (r.), *Ganges*.
 Aluta (r.), *Danube*.
 Alva, *Stirlingshire*.
 Alveolar abscess, *Teeth*.
 Alwen, *Dee*.
 Alyu, *Dec, Flintshire*.

Alz (r.), Chiem-See.
 Alzahan, Arabian Lang. & Lit.
 Amabaxa, Kaffaria.
 Amafengu, Kaffr.
 Amak, Copenhagen.
 Amalaswintha, Theodoric.
 Amalgama, Gold.
 Amalthæa, Sibil.
 Amantiline, Fungl.
 Amara (mt.), Apennines.
 Amaranth bark, Mahogany.
 Amatebele tribe, Zambesi, Zulu.
 Amativeness, Purenology.
 Amazon stone, Felspar.
 Amazulu, Zulu.
 Ambaree hemp, Hibiscus.
 Amberbackin (mts.), Papua.
 Amberrion, Papua.
 Ambert, Puy-de-Dome.
 Ambiguous middle, Fallacy.
 Amblycephalus, Hop Froth-Fly.
 Ambo, Pulpit.
 Amboyna wood, Klaboucca.
 Ambracia, Arta.
 Ambrefu, Ambergria.
 Ambrette, Hibiscus.
 Ambulance corps, War Services.
 Ameland, Zuider Zee.
 Amenemha I., Egypt.
 Amenophis, Egypt.
 Amen Ra, Egypt.
 Ament, Amenthes.
 Amental Alliance, Amentacæ.
 Ameria, Amelia.
 American aloe, Agave.
 American blight, Aphid.
 Ameshaspentas, Zoroaster.
 Amhar, Abyssinia.
 Amherst (i.), Magdalen Is.
 Amherst province, Tenasserim.
 Amia, Mud-fish.
 Amico, Vestments.
 Amida, Diarbekr.
 Amiens cathedral, Gothic Architecture.
 Amiles, Organic Basca.
 Aniot, Amyot.
 Aniternum, Aquila.
 Ammania vesicatoria, Lythracæ.
 Amner, Bavaria.
 Ammonia, Cornua, Ammonites.
 Ammonium, Ammonia.
 Ammonioosuck (r.), White Mountains.
 Amœba, Rhizopoda.
 Amorgos, Greece.
 Ampanam, Lombok.
 Ampelidæ, Vitacæ.
 Amphiarau, Oracle.
 Amphipneusta, Respiration.
 Amphibienidæ, Serpents.

Amplexicaul, Leaves.
 Amrawati, Oomrawutte.
 Amrita, Ambrosia.
 Amru, Oinar.
 Amstelland, Amsterdam.
 Amu, Amu-Daria (r.), Oxus.
 Amun-Ra, Ammon.
 Amur, Amoor, Mantchuria.
 Amurath I., II., III., IV., Ottoman Emp.
 Auacantha, Malacopterygil.
 Auacharris Cloots, Cloots.
 Anacletus, Pope, Roger II.
 Anaconda, Boa, Python.
 Anacoetia (r), Washington City.
 Anadir, Gulf of, Siberia.
 Aundoll, Auatolla.
 Anæsthetics, Methylene.
 Anama, Zoology.
 Anakatt, Coleroon.
 Analache, Andes.
 Analytical Chemistry, Analysis (in Chem).
 Analytical machine, Calculating Machine.
 Auam, Cochín China.
 Anambas Islands, Klouw.
 Ananas, Pine-apple.
 Anasarca, Dropey.
 Anastase, Titaulum.
 Antidæ, Anas.
 Auceia, Loire-inférieure.
 Anchises, Eneas.
 Aucholme (r.), Lincolnshire.
 Auchlam, Ankham.
 Ancyus, Limuga.
 Andalgala, Fuerte de Andalgala.
 Andegavum, Angers.
 Andersonian University, Anderson, John.
 Andes (mts.), Queensland.
 Andœ, Lofoden.
 Andran, Engraving.
 Andre, Loire.
 Andrea Pisano, Sculpture.
 Andrelanowsky Islands, Alentian Islands.
 Andrews, St., America.
 Androcides, Painting.
 Andromachus, Med., Hist. of.
 Andromeda arborea, Sorrel Tree.
 Andros, Bahamas.
 Androscoggiu (r.), Maine.
 Androsphinx, Sphinx.
 Aneorhiza Capensis, Umbellifera.
 Aneurin, Welsh Lang. & Lit.
 Anzo, Navarre.
 Anfora, Amphora.
 Angara (r), Yenisei, Baikal.
 Angazlya, Comoro Isles.
 Angiolocutis, Aderitis.

Angelology, Anatomy.
 Angelica Salvatior, Ave Maria.
 Angelim, Partridge-wood.
 Angels, Angles.
 Angels, Bishop.
 Angina, pectoris, Heart, Diseases of.
 Angle, Trisection of, Quadrature of the Circle.
 Anglican Church, Anglo-Catholic Church.
 Anglin, Indre.
 Angoumois, France.
 Angra Pequena, Namaqualand.
 Angtrivari, Saxons.
 Angus, earls of, Stewart Family.
 Angustura bark, Angostura Bark.
 Anhulvarra, Râpoots.
 Anhulwar, Puttun.
 Ani, Crotophaga.
 Aniene (r.), Tiber.
 Anil, Indigo.
 Aniline, Phenyl.
 Aniline green, Dye-stuffs.
 Aniline purple, Dye-stuffs.
 Animal Kingdom, Animal.
 Animé, Incensed.
 Anio (r.), Tiber.
 Anjou, Auode.
 Anis (mt.), Puy, Le.
 Aniseed cordial, Liqueur.
 Aniva Bay, Sakhalin.
 Anjuna, Marut.
 Anjouan, Comora Isles.
 Annalee (r.), Cavan.
 Annandale and Mau, lords of, Stewart Family.
 Annat, Ann.
 Annatom, New Hebrides.
 Annatto, Arnotto.
 Auncy, Savoy.
 Aunesley (b.), Massowah.
 Annouem or Annoniacum, Aumouay.
 Annos, Egypt.
 Annotta, Arnotto.
 Annulties, Post-office Insurance.
 Annulata, Worms.
 Annuloida, Radiata.
 Annulosa, Worms.
 Anomaly, Analogy.
 Anona palustris, Razor-strop.
 Anoplura, Parasita.
 Ansari, Persiau Lang. & Lit.
 Ansbach, Anspach.
 Anscharius, Ansgar.
 Anstruther, Fifeshire.
 Anta, Egypt.
 Antakieh, Antioch.
 Antalo, Abyssinia.
 Antanaranga Pass, Andes.
 Anthea Cereus, Anemone, Sea.
 Anthelmintics, Vermifuges.

Antheræ, Silk and Silk-worm.
 Antherozoids, Phytozoa.
 Anthochæra, Wattle-Bird.
 Anthocyan, Blue.
 Anthollites, Trigonocarpon.
 Anthomyia, Cabbage Fly, Turnip Fly.
 Anthouomus, Weevil.
 Anthriscus, Chervil.
 Anthropopathism, Anthropomorphism.
 Antiburghers, U. P. Church.
 Anticars, Antiquera.
 Antidorsas, Springbok.
 Anti-federalists, Republican, U. S.
 Antilla, Tortona.
 Antiochia ad Surum, Adana.
 Antiochia ad Taurum, Ain-Tab.
 Antipater, Stoics.
 Antipolis, Antibes.
 Anti-renters, Republican.
 Antisana, Andes.
 Antiscorbutic beer, Spruce, Essence of.
 Antispasmodics, Spasm.
 Antjar, Upas.
 Antlers, Ruminantia.
 Anton (r.), Hampshire.
 Antongil Bay, Bembaotoka.
 Antoula, Jerusalem.
 Antony (mt.), New York.
 Antony of Padua, Antonius, St.
 Antony of Thebes, Antony, St.
 Austrostomus, Whip-poor-Will.
 Ant-thrush, Ant-catcher.
 Avelro, Avelro.
 Antuco, Ander.
 Antunnacum, Andernach.
 Anuka, Egypt.
 Anunghoy, Bocca Tigris.
 Anus, Rectum.
 Auvers, Antwerp.
 Anwoth, Vitified Forts.
 Aoudad, Sheep.
 Aounah, Aonlaganj.
 Aps, Paraguay River.
 Apateon pedestris, Archegosaurus.
 Apelba, Tillaceæ.
 Aperispermic, Albumen.
 Apes, Nest-building Apes.
 Aphanite, Trap.
 Aphelandra, Acanthus.
 Aphemia, Aphasia.
 Aphid-llons, Golden-eye Fly.
 Aphrodisia, Aphrodite.
 Aphrodite, Sea Mouse.
 Apin, Upolu.
 Apilne, Parsley.
 Apicalental, Mammalia.
 Aplysia, Tectibranchinta.
 Apollinapolis Magna, Edon.
 Apollonia, Cyrenaica.
 Aponeurotic membranes, Skeleton.
 A-posteriori, A-priori.

- Apostoolists, Anabaptists.
 Apparent distance, place, Vision.
 Appellants, Unigenitus, Bull.
 Appendix vermiciformis, Allimentary Canal.
 Appin, Argyleshire.
 Apple (mts.), Irkutsk.
 Applecroses Sound, Raasay.
 Apples, oil of, Valerianic Acid.
 Appomattox (r.), James River, Vir-
 ginia.
 Appreciation, Appraisers.
 Apries, Egypt.
 Apt, Vaucluse.
 Aptenodytes, Penguin.
 Apuleius, Appuleius.
 Apulium, Carlsburg.
 Aprimac, Peru.
 Aquæ Gratiassæ, Aix.
 Aquæ Pannoniæ, Baden-Baden.
 Aqua Sextiæ, Aix.
 Aquæ Ferventiæ, Marino.
 Aquæ-Sextiæ, battle of, Rome.
 Aqueduct, right of, Servitude.
 Aquilina, Braka.
 Aquilonia, Agnone.
 Aquis Granum, Aix-la-Chapelle.
 Arabah, Syria, Red Sea.
 Arabian tea, Catha.
 Aractus, Aria.
 Aracynthus, Etolia.
 Aradus, Phenicia.
 Aragua, Cumana.
 Araguay-Guaso, Pilcomayo.
 Araguay-Mluc, Pilcomayo.
 Aramaic lang., Aramæa.
 Araneiformes, Pylæogonidæ.
 Arapey (r.), Uruguay.
 Arara, Macaw.
 Aras, Armenia, Azerbaijan.
 Aransio, battle of. Rome.
 Araxes, Aras, Azerbaijan.
 Arba, Dominis, M. A. de.
 Arber (mt.), Bavaria.
 Arbigny, Chislerots.
 Arbil, Arbela.
 Arbogastes, Valentinianus.
 Arbor Diana, Amalgam.
 Arborfeilx, Reichstadt.
 Archaeology, Biblical, Biblical Archaeo-
 logy.
 Archiopteryx, Solenhofen Stone.
 Archingathus, Agathocles, Medicine,
 Hist. of.
 Archambaud I. Bourbon.
 Archbishop (ja.), Boulu.
 Archedemus, Stoics.
 Archegonia, Vegetable Physiology.
 Archer, Photography.
 Archil, Dye-stuffs.
 Archilochian Verse, Archilochus.
 Archimandrite, Greek Church.
 Arctostaphylos, Arbutus.
 Arcubalest, Arbalest.
 Arculfus, Adamnan.
 Ardakllin (l.), Craunoges.
 Ardebil, Azerbaijan.
 Ardila, Guadalupe.
 Ardish, Akhlat.
 Ardshir, Sassanidæ.
 Ardmeanach, Ross and Cromarty.
 Arduarce, Sligo.
 Ard-Righ, Ireland.
 Areng, Gomuto.
 Arenicoll, Scarabæidæ.
 Arenig beds, Silurian Rocks.
 Arensburg, Oesel.
 Argulus, Fish-louse.
 Argas, Acarna.
 Argôles, Pyrénées, Hautes.
 Argens (r.), Var.
 Argensola, Spanish Lang. & Lit.
 Argentaro (mts.), Albania.
 Argenta, Ornic.
 Argentite, Glance.
 Arghel, Argel.
 Argo, Argonauts.
 Argos, Argolia.
 Argostoll, gulf of, Lixuri.
 Argoun, Amoor.
 Argovie, Aargau.
 Arguenson, Cotes-du-Nord.
 Arguin, Blanco.
 Argumentum, Wildfowl.
 Argumentum ad Hominem, Fallacy.
 Argun, (r.), Siberia.
 Argyro Castro, Albania.
 Ariatas, Jainas.
 Aria, Pyrus.
 Ariana, Afghanistan.
 Aricari, Aracari.
 Arichat, Cape Breton.
 Aricia, Rome.
 Aricie, Quinia.
 Aridæus, Alexander the Gt.
 Arimium, Rimini.
 Arisaig, Inverness-shire.
 Arithmometer, Calculating Machine.
 Arjal, Transylvania.
 Ark-shell, Arc.
 Arktos and Arktus, Ursa Major.
 Arles, Earnest.
 Arinagh, book of, Irish Lang.
 Armed bullhead, Poggo.
 Arncliffe, New South Wales.
 Armiger, Esquire.
 Arming-press, Book-binding.
 Armoric hills, Cotes-du-Nord.
 Arms, Breech-loading Arms.
 Army Hospital Corps, Staff Corps.
 Army of Reserve, Reserve.
 Arna, Aruce.

- Arnald, of Brescia, Arnold.
 Arnatto, Arnotto.
 Arnauts, Albanians.
 Arnette (r.), Mazamet.
 Arney, Fermanagh.
 Arnold, Abbot of Cîteaux and Milo, Albigenese.
 Arnold, General, André, J., U. S.
 Arnulph, Carlingfordians.
 Arnut, Earthnut.
 Arce, Slesvig.
 Aromatics, Gems.
 Aronia, Cratægus, Pyrus.
 Aroostook (r.), White Mountains.
 Arosa (b.), Spain.
 Arpa (r.), Aras.
 Arra (r.), Tipperary.
 Arracan, Aracau.
 Arran Mowddy, Merioneth.
 Arrats, Gers.
 Arrher, Diligence.
 Arrlege, Arlege.
 Arroo, Papua.
 Arroux, Côte d'Or.
 Arrow (l.), Sligo.
 Arrow (r.), Herefordshire.
 Arrow (r.), Otago.
 Arrow (r.), Superior, Lake.
 Arrow-headed, Cuneiform.
 Arrowsmith, Moreton Bay.
 Arrowsmith (mt.), Vancouver's Island.
 Arn, Moluccas.
 Arsinœ, Cyrenaica.
 Artabanus, Parthia.
 Artamus, Wood-swallow.
 Art and part, Accessary.
 Arte Maggiore, Algebra.
 Artemisium, battle of, Themistocles, Xerxes.
 Artemon, Humanitarians.
 Artemus Ward, Brown, C. F.
 Arteritis, Arteries, Dis. of.
 Arthropoda, Worms.
 Articles de Reims, Rheims.
 Artificial Limbs.
 Artificial Stone, Stone, Artificial.
 Artillery (l.), Great Slave Lake.
 Artillery Company, Honourable, Volunteers.
 Artillery, Royal Reg. of, War Services.
 Aruba, Curapoa Is.
 Arun (r.), Sussex.
 Arundel, Earls of, Stewart Family.
 Aruns, Tarquinia.
 Arvn, Ava.
 Arve (r.), Alps, Rhone, Savoy.
 Arx, Arca.
 Arzen, Algeria.
 Asagræn, Sabadilla.
 Asben, Afr.
 Ascaris, trichlura, Trichocephalus.
 Ascella, Rhizopoda.
 Asclepiades, race of, *Æsculapius*.
 Asclepias acida, Soma.
 Ascomycetes, Fungi.
 Ascough, Askew.
 Asdruba', Hasdruba'.
 Asñ, Salm.
 Asgard, Scand. Myth.
 Asha, Arabian Lang. & Lit.
 Asharians, Mohammedan Sects.
 Ashdod, Azotus, Philistines.
 Ashdown Forest, Sussex.
 Ashera, Phœnicia.
 Ashkelon, Acalon.
 Ashkoko, Cony, Daman.
 Ash-leaved Maple, Negundo.
 Ashley (r.), Chartistou.
 Ashtabula, Ohio.
 Ashtaroth, Philistines.
 Asiento d'Ambato, Ambato.
 Asinara (l.), Sardinia Is.
 Askalou, Phœnicia.
 Asmannshäuser, Rhine-wine.
 Asoka, Buddhism, India.
 Asopna, Greece.
 Asow, Azov.
 Asparagin, Solomon's Seal.
 Asparagus Stone, Apalite.
 Asperced, Semé.
 Aspherou, Caspian Sea.
 Asphyxiated shell, Stinkpot.
 Asplenium, Lady Fern.
 Aspro, Zingel.
 Aspropotamo, Achelous.
 Ass, Indian, Unicorn.
 Ass, Wild, Unicorn.
 Assafœtida, Assafœtida.
 Assamar, Glucose.
 Asce, Dracene.
 Asser, Alfred.
 Assessment, Rate.
 Asshur, Assyria.
 Assignees, Assigns.
 Assinie, Ashanti.
 Assia, Sejan.
 Associate Synod, U. P. Ch.
 Assonance, Rhime.
 Assumption, Tobago.
 Asteria, Delos.
 Asteria Sapphires, Corundum.
 Atharata, Egypt.
 Asthenia, Death.
 Asthma, Heart, Diseases of.
 Astigle, Echja.
 Astley's New Pit, Dukinfield.
 Astoria, Oregon.
 Astragal, Gun.
 Astragalus, Foot.
 Astrape, Torpedo.
 Astric, Anastasius, St.
 Astronnyces, Star-nose.

- Astroni (l.), Agnano.
 Aena (r.), Nile, Albert Nyarza.
 Aewins, Sârya, Yama.
 Atabyris, Rhodes.
 Atacama Desert, Bolivia.
 Atairo (mt.), Rhodes.
 Atak, Indus.
 Ataman, Hetman.
 Atax, Aude.
 Athara (r.), Nile, Adown, Baker, Sir S.
 Atho, Edfon.
 Atchison, Kansas.
 Lthalia spinarum, Sawfly.
 Atharvaveda, Veda.
 Athaulf, Spain.
 Athelney, Alfred.
 Athene, Minerva.
 Athenodoros, Stoics.
 Atheroma, Arteries, Dia. of.
 Atherure, Porcupine.
 Athole, Earls of, Stewart Family.
 Athothia, Egypt.
 Athyrium, Lady Fern.
 Atina, Trebizond.
 Atlantides, Africa.
 Atmelau, Constantinople.
 Atolla, Coral Islands.
 Atom, Chemistry.
 Atomic Weight, Chemistry.
 Atonement Controversy, U. P. Church.
 Atta, Ant.
 Attalus III. Philometer, Rome.
 Attaran (r.), Tennessee.
 Attar of Roses, Otto.
 Attibawmeg, Whitefish.
 Attock, Indus.
 Au, Munich.
 Aubenas, Ardeche.
 Auberjine, Egg-plant.
 Auberlin, Pyrenees, Basses.
 Aubigne, Lords of, Stewart Family.
 Aubisson, Creuse.
 Aucklandia, Putchuk.
 Aufklärung, Pietists.
 Angluacloy, Tyrone.
 August, Basel.
 Augusta, London.
 Augusta, Agosta.
 Augusta Vindelicornum, Augsburg.
 Angustenburg, Oldenburg.
 Angustenburg, Prince Frederick of, Slesvig.
 Augustin I. (Mexico), Iturbide.
 Augustodunum, Autun.
 Auldern, Nairnshire.
 Anlagas (l.), Desaguadero.
 Aulne, Finistère.
 Anlostomide, Fistularidae.
 Aumery, Ambry.
 Anne, Dartmoor.
 Anpa (r.), Bohemia.
 Anrangzib, Aurangzebe.
 Aureole, the, Nimbus.
 Auricle, Ear.
 Auricles, Circulation.
 Anriflamme, Oriflamme.
 Anripolis, Ingolstadt.
 Aurochs, Bison.
 Aurora, New Hebrides.
 Auspices, Auguries.
 Ausserrhoden, Appenzell.
 Austin Friars, Augustine.
 Austin, Moses, Texas.
 Australian copal, Kauri.
 Australian dammer, Kauri.
 Austria, Germany.
 Authie, Pas-de-Calais.
 Authography, Lithography.
 Autobiography, Biography.
 Autoclithones, Aborigines.
 Autoclave, Digester.
 Autumn, Seasons.
 Aux Cerfs (l.), Seychelles Is.
 Anson, Carpentras.
 Ava, empire of, Burmah.
 Avail of marriage, Wardholding.
 Aval (la.), Bulrein Island.
 Avasdale, Lords, Stewart Family.
 Aven, Dartmoor.
 Avena, common, Geum.
 Aventine Hill, Rome.
 Avenza, Carrara.
 Avenzoar, Medicine, Hist. of.
 Averdupois, Avoirdupois.
 Avereest, Overijssel.
 Aversie, Indigo.
 Avesnes, Nord.
 Avia, Galicia.
 Avignon berries, Buckthorne.
 Aviles, Asturias.
 Aviona, Albania, Berat.
 Avon (r.), Dartmoor.
 Avon (r.), Linsithgow.
 Avon (r.), Nova Scotia.
 Avoset, Avocet.
 Award, Arbitration.
 Awe, Argyllshire.
 Awkward squad, Squad.
 Ay, Moluccas.
 Ayapana, Eupatorium.
 Ayasuluk, Ephesus.
 Aycotta, Cranganore.
 Aylmer (l.), Great Slave L.
 Ayscough, Sir G., Ruyter.
 Ayton, Bervickshire.
 Ayubite dynasty, Saladin.
 Azarole, Cratægus.
 Azazil, Mohammedanism.
 Azim's Fort, Azimghur.
 Azimuthal condensing light, Light-house.
 Azio, Actium.

Azogúo, Andes.
Azote, Chemistry.
Azraël, Mohammedanism.
Azteca, Mexico.
Azuline, Dye-stuffs.
Azure Stone, Lapis Lazuli.
Azym*, Unleavened Bread.
Azzeddin, Arab. Lang. & Lit.

Baalzebub, Philistines.
Baasher (r.), Algoa Bay.
Baastauris, Griquas.
Baba, Mohammedan Sects.
Babahan, Fars.
Babahoyo, Guayaquil.
Babee, Bawboe.
Babegan, Persia.
Babi, Sumatra.
Babine (l.), Columbia, British.
Babul, Acacia.
Babur, Baber.
Babuyan (l.), Philippine Is.
Bacchantes, Bacchus.
Bacchiglione (r.), Austria, Vicenza.
Bacchus-wine, Naxos.
Bachelors' buttons, Ranunculus.
Bachilo (r.), Magdala.
"Backing the field," Horse-racing.
Backplate, Breastplate.
Backstays, Rigging.
Back-water, Water-power.
"Backwaters," Ghauts.
Bacon beetle, Clavicornia.
Baconiana, Ann.
Bacs Canal, Zombor.
Bactra, Bactria.
Baden, Germany.
Badenoch, Lords of, Gordon Family.
Bael, Aurantiaceæ.
Biel, Bhel.
Bética, Andalusia, Spain.
Buffs, Bassa.
Bagenalstown, Carlow.
Bagyll, Salmon.
Baghorla, Bagaria.
Baghistan, Behistan.
Bagirmi, Begharin.
Bagnol, Muscatel.
Bagradas (r.), Tunis.
Bahia, Cotton.
Bahour, Pondicherry.
Bahr-el-Abiad, Nile.
Bahr-el-Asirad, Abyssinia, Nile.
Bahr-el-Azrak, Nile.
Bahr-el-Gazal, Nile.
Bahr-el-Merj (l.), Damascus.
Bahr-Jusuf, Mæris (l.).
Bahr Loot, Dead Sea.
Balern, Bavaria.
Baillie, Baillif.
Baillments, Contract.

Balla, Cricket.
Balm, Telegraph.
Bainbridge, Down.
Balocco, Bajocco.
Bairam, Beiram.
Baise (r.), Garonne, Gers.
Bait-fishing, Angling.
Bajada de Santa Fe, Entre Rios.
Bajan, Bejan.
Bajazet I., II., Ottoman Empire.
Bajkerkeit, Pangolin.
Bajra, Ajmeer.
Bakar, Buccari.
Baker (mt.), Washington (ter.).
Bakhtegan (l.), Fars, Persia.
Baki, Turk. Lang. & Lit.
Bakwains, Bejuanas.
Bal, Bally.
Bala beds, Caradoc Sandstone.
Balachiam, Cochiu-China.
Balais, Balay.
Balan, Transylvania.
Balance-sheet, Book-keeping.
Balaninus, Weevil.
Balanites Egyptiaca, Amyridaceæ.
Balanophora and Balanophoraceæ, Rhizanthææ.
Balas ruby, Spinel.
Balasore, Cuttack.
Balassa-Gyarimat, Gyarmat-Balassa.
Balbriggan, Dublin.
Balcarres and Crawford, Earl of, Lindsay Family.
Balcony of Puglia, Minervino.
Bald Buzzard, Osprey.
Baldjik, Baltechiik.
Baldur, Balder.
Baldwin I., II., Byzantine Empire.
Baleen, Whale.
Balgay Hill, Dundee.
Balra (r.), Andorra.
Balkash (l.), Semipalatinsk.
Balamgarh, Buluhguri.
Ballater, Dee.
Ballinderry (r.), Cookstown, Tyrone.
Ballista, Ballista.
Ballon d'Aleace, Vosges Mts.
Ballon de Guebwiller, Vosges Mts.
Ballota nigra, Horehound.
Bally, Ball.
Ballymahon, Longford.
Ballymote, Book of, Irish Lang.
Baloum tree, Pestacia.
Balquidder, Perthshire.
Balsam apple, Momordica.
Balsamo, Giuseppe, Cagliostro.
Baltic cod, Dorset.
Baltlingass, Wicklow.
Balveny, Banffshire.
Balverda, Baleward.
Bamboroughshire, Shire.

- Bambla, Hibiscus.
 Banana (Is.), Sierra Leone.
 Banca, Sumatra.
 Banchory-Ternan, Dee.
 Banda, Bundelcund.
 Bandaleer, Bandoleer.
 Banded sea-snake, Hydridæ.
 Ban de la Roche, Oberlin.
 Banderillas, Bull-fight.
 Bandiat, Charente.
 Bandikal, Hibiscus.
 Bangor, U. S., Penobscot.
 Banlan, Banyan.
 Banjer, (r.), Banjermassin.
 Banjoewangi, Java.
 Banjouwangy, Banyuwangy.
 Bank-notes, Greenbacks.
 Bank's Strait, Melville.
 Banu (r.), Antrlin, Coleraine, Neagh (l.).
 Baun, Upper (r.), Down.
 Baunatyn Club, Roxb. Club.
 Bannocks, Bread.
 Banquette, Covert Way.
 Banshee, Beishie.
 Bantling, Obesity.
 Banza, Congo, San Salvador.
 Baphia, Camwood.
 Bara, Kordofan.
 Barabras, Nubia.
 Barada (r.), Syria.
 Bara-isa, Niger.
 Baranula, Cashmere.
 Baranula Pass, Jhelum.
 Barante, French Lang.
 Baratry, Barratry.
 Baranyuki, Russian Lang. & Lit.
 Barb, Horse.
 Barbadoes nuts, Physic Nut.
 Barbarea, Rocket.
 Barbarette, Runtan.
 Barberry root, Dye-stuffs.
 Barbet, Poodle.
 Barbezieux, Charente.
 Barcelona, Cumana.
 Barcelona nuts, Hazel.
 Bardita, Bard.
 Bardou Hill, Leicestershire.
 Bardsey Isle, Cardigan Bay.
 Barebones Parliament, Rump Parliament.
 Bargander, Barnacle Goose.
 Bar-gemel, Barr.
 Barguain, Baikal.
 Barlatinsky, Shamyl.
 Barisan (mts.), Sumatra.
 Barium, Bari.
 Bark, Barque.
 Barkhusen, Hermann, Reynard the Fox.
 Barking marmot, Prairie Dog.
 Barking squirrel, Prairie Dog.
 Bark-speeler, Creeper.
 Barlaam, Hezychasta.
 Barle, Exc.
 Bar-le-duc, Menne.
 Barley midge, Cecidomyia.
 Barmouth Bay, Merioneth.
 Barnaul, Altai Mts.
 Barnburner, Republican.
 Barnes, Thomas, Times, The.
 Barnet, battle of, Richard III.
 Barouche, Coach.
 Barr, Bar.
 Barracks, War Services.
 Barraconda, Gambia.
 Barraconda, Sphyræulidæ.
 Barrada, Damascus.
 Barrancas, Mexico.
 Barras, Directory.
 Barrastera, Barristers.
 Barrety, Barratry.
 Barrington Isle, Galapagos Is.
 Barrow, Kildare, Queen's County.
 Barrow (l.), Barrow-in-Furness.
 Barrulet, Barr.
 Bars, Barsch.
 Bars Khotan, Bars Khotun.
 Bar-sur-Ornain, Bar-le-Duc.
 Bart, Jean, Barth.
 Barton beds, Bagshot Bed.
 Barwon (r.), Victoria.
 Barygaza, Baroach.
 Baseuto (r.), Basento.
 Bashee (Is.), Philippine Is.
 Bashee (r.), Tembu.
 Bashkirs, Turks.
 Basic water, Salla.
 Basilla, Basel.
 Basilus I., II., Byzant. Emp.
 Basle, Basel.
 Basoche, Buzoche.
 Basrah, Bassora.
 Bass, Base.
 Bass, Bast.
 Bass, Dou.
 Bassadore, Basidoh.
 Basseln, Pegu.
 Basseln, Olivier, Vaudeville.
 Bassenthwaite Water, Cumbrian Mts.
 Basen-Alpes, Alpes, Basen.
 Baseterre, Christopher's, St.
 Basic acid, Stearic acid.
 Bassorin, Mucilage.
 Bastan, Navarre.
 Bastard, Parent and Child.
 Bastard cedar, Chittagong Wood.
 Bastard crop, Thymus Gland.
 Bastard gnava, Eugenia.
 Bastel (mt.), Saxony.
 Basto, Quadrille.
 Batabano, Cuba.
 Batuf, Moldavia.
 Batausa, Bashan.

- Bataneu (i.), Philippine Is.
 Batanta, Papua.
 Batham, Exe.
 Bathang, Tibet.
 Bath-metal, Alloy.
 Bathy, Samos.
 Batjan, Moluccas.
 Batley, Dewsbury.
 Batoom, or Batoum, Batum.
 Battery, Bunsen's, &c., Galvanism.
 Battiferri, Lanra, Ammanate.
 Battle of the Spurs, Guinegate.
 Battock (mt.), Kincairdineshire.
 Batû (i.), Sumatra.
 Batua root, Cassampelos.
 Batû Khan, Russia.
 Batz, Bus.
 Baugis, Philemon.
 Baudrich, Baldrick.
 Bauge, Maine-et-Loire.
 Bauge, subterranean lakes of, Savoy.
 Bauld Cape, Newfoundland.
 Bank, Billiards.
 Baume-les-Dames, Doubs.
 Bautzen, Lusatia.
 Bavaria, Germany.
 Bay, Floors.
 Bayad, Egypt.
 Bayard of India, Outram.
 Bayard of the French army, Ondinot.
 Bayberry, Candelberry.
 Bayern, Bavaria.
 Bayezed, Bayazid.
 Bay-laurel, Cherry-laurel.
 Bay of All Saints, Bahia.
 Bay of Islands, N. Zealand.
 Bayonet exercise, Fencing.
 Bay rum, Spirit.
 Bay-stall, Bay-window.
 Bazaar, Bazar.
 Beachy Head, battle of, Tonrville.
 Beacons, Lighting of Beacons, &c.
 Bead tree, Meliaceæ.
 Beaked whale, Bottlehead.
 Bechteln, Beiltein.
 Bear (i.), Bantry Bay, Cork.
 B-arberry, Arbutus.
 Beard, use of, Hair.
 Bearded griffin, or vulture, Lammer-
 geier.
 B-ardie, Loach.
 Bear's paw, Cham.
 Beas, Chenab.
 Beatification, Saints.
 Beaufrans, Apple.
 Beaulieu, Bewdley.
 Beauvy, Inverness-shire.
 Beaumaris Shark, Porbeagle.
 Beaune, Côte d'Or.
 Beaupré-au, Maine-et-Loire.
 Beauvoir, Visor.
 Beaver rats, Hydromys.
 Becard, Salmon.
 Bec d'Oie, Dolphin.
 Bechena, Delhi.
 Bechuana, Bechuana.
 Becque, Beaked.
 Becuna, Sphyrænidæ.
 Bedan-ambrun, Argyleshire.
 Bede, Bead.
 Beds, Beda.
 Bedehouse, Road.
 Bedesman, Bead.
 Bedford, Dukes of, Russell, House of.
 Beebeern, Beebeern, Greenheart.
 Bee-bread, Bee.
 Beech-drops, Cancer Root.
 Beechmast, Beech.
 Beef-wood, Casuarina.
 Beckaneer, Bikaur.
 Beemah, Calburga.
 Beer, Ale, Barley.
 Beeroo, Birn.
 Beet coffee, Beet-root Sugar.
 Beet-spirit, Beet-root Sugar.
 Befort, Belfort.
 "Beggars, The," Gaux.
 Beggars of the Sea, William, Prince of
 Orange.
 Bagging Hermits, Augustines.
 Beghards, Beguines.
 Begierbeg, Beg.
 Bego (r.), Thelms.
 Begutæ, Beguines.
 Behar, Bahar.
 Belbehan, Fara.
 Behring's Island, Behring's Strait.
 Belgerland, Beyerland.
 Belkos, Begkoa.
 Bel-kul, Balkal.
 Belline, Beiltein.
 Beirut, Beyrouit.
 Belt-al-Haram, Belt.
 Belt-el-Maa, Daphnæ.
 Belth, Ayrshire.
 Beit-laham, Bethlehem.
 Beitool, Baltool.
 Beit Ullah, Mecca.
 Beja, Alemejo.
 Bel, Baul.
 Beleern, Greenheart.
 Belem, Para.
 Belfast, U.S. Penobscot.
 Belfast (i.), Down.
 Belize, Balize.
 Bell, Melville, Shorthand.
 Bellac, Vienne, Haute.
 Bellagio, Como (i.).
 Bell animalcules, or Bell-flower animal-
 cules, Vorticellidæ.
 Bellano (i.), Como (i.).
 Bellary, Balaghat.

- Bellay, J. du, Ronsard.
 Bell-bird, Honey-eater.
 Bellenz, Bellinzona.
 Bellevue, Iowa.
 Bellino, Baudit.
 Beiotto, Bernardo, Cavaletto.
 Bellows, Blowing-machines.
 Belluno, Duke of, Victor.
 Bel-lush, Assyria.
 Belly (r.), Saskatchewan.
 Bellyache, Colic.
 Bel-merodach, Assyria.
 Belper, Derbyshire.
 Belshazar, Belshazzar.
 Belhane, Beltein.
 Beltidun, Roemary.
 Belturbet, Cavan.
 Belu, Amherst.
 Beluchie, Sinde.
 Belud-el-Jerid, Barbary, Tunisia.
 Beluga, Dolphin.
 Beluka (mt.), Altai Mts.
 Belus, Baal, Dido.
 Ben-a-Mam, Banffshire.
 Benarty, Kinross-shire.
 Ben-avenna, Daventry.
 Bencloch, or Bencleugh, Clackmannan-shire.
 Ben Creach, Argyleshire.
 Ben Cruachan, Grampians.
 Bender, Gombroon.
 Benedetto Odescalchi, Innocent XI.
 Benedict XIII., Pope, Schism, Western.
 Benet College, Corpus Christi.
 Bengal Fire, Red, Strontium.
 Bengal Hemp, Sunn.
 Bengal Light, Pyrotechny.
 Benghazi, Tripoli.
 Bengica, India.
 Beni, Bolivia.
 Beni, Madeira.
 Beni-Hassan, Necropolis.
 Ben Ima, Argyleshire.
 Benjamin tree, Benzoin.
 Ben-jemma, Malta.
 Ben Kilbert, Sutherland.
 Ben Lomond, Tasmania.
 Ben Lur, Tay.
 Ben More in Assynt, Sutherland.
 Benmore Head, Fair Head.
 Ben-na-haird, Aberdeenshire.
 Benne, Niger.
 Bennear, Cantire.
 Bennington, Vermont.
 Ben Rinnes, Banffshire.
 Bensart (l.), Tunisia.
 Ben Starvie, Eliva.
 Bentang, Brindondron.
 Ben Volrich, Dumbartonshire.
 Ben Wyvis, Ross & Cromarty.
 Ben-y-Gloe, Gientilt.
 Benzerta, Bizerta.
 Benzine, Benzole.
 Benzoin odoriferum, Allspice.
 Benzoyl, Benzile.
 Berat, Albania.
 Beraun, Moldau.
 Berbera, Somali Land.
 Berberin, Dye-stuffs.
 Berbers, Barbary.
 Berchemia, Supple Jack.
 Bere, Barley, Bear.
 Berengaria, Richard I.
 Beresina (r.), Dnieper, Vilno.
 Bereyda, Wahabia.
 Berezina (r.), Beresina.
 Berezov, Berezoff.
 Bergamah, Pergamus.
 Bergeronetta, Wagtail.
 Berghen, Mons.
 Berg-mehl, Animalcule.
 Berg-Zabern, Zabern.
 Berkeley's theory of vision, Vision.
 Berlin Decree, Continental System, Orders in Council.
 Berlin-work, Embroidery.
 Bermudez, Gerónimo, Spanish Lang. & Lit.
 Berna, Berni.
 Bernard, Richard, Sabbath.
 Bernardin Pass, Alps.
 Berne, Bern.
 Bernese Oberland, Bern.
 Bernesgn, Leon.
 Bernbard, St. Abelard.
 Bernia, Berni.
 Bernicle, Barnacle.
 Bernstorff, Christian VII.
 Beroo, Biru.
 Berothal, Beyrout.
 Beron (r.), Berneo.
 Berre, l'Étang de, Rhône.
 Berri, Berry.
 Berry-bearing alder, Buckthorn.
 Berthelot, Sulfure.
 Bertraud de Born, Troubadour.
 Berubium, Duncansby Head.
 Bervie, Klucardineshire.
 Bervies, Haddock.
 Berytus, Beyrout, Phœnicia.
 Bea, Saugor.
 Beauty Cross, Besants.
 Bessi, Servia.
 Bessus, Alexander the Great.
 Bestushev, Rus. Lang. & Lit.
 Betanzos, Cornua.
 Beteln, Bethel.
 Betel-nut palm, Aroca.
 Bethesda, Caernarvonshire.
 Bethlehemite Order, Cross, Order of.
 Bethune, Cardinal, Beaton.

Bethune, Pas-de-Calais.
 Betik, Betick.
 Betle, Betel.
 Betony, Stachys.
 Betula, Birch.
 Betulaceæ, Betulaceæ.
 Betwa (r.), Jumna.
 Beukels, Beukelszoon.
 Bey, Beg.
 Bey-Keme (r.), Yenisei.
 Beypore, Bepur.
 Bezant, Roundle.
 Bezant argent, Plate.
 Bezantée, Bezants.
 Beziers, Albigeuses.
 Bezour-stones, Coprolites.
 Bhabhur, Cotton Grass.
 Bhadri (r.), Bellur.
 Bhageerette (r.), Bhadrinath.
 Bhaghireti (r.), Ganges.
 Bhagruttee (r.), Burhampore.
 Bhagrutti (r.), Ganges.
 Bhagui, Bagui.
 Bhamo, (r.), Irrawadi.
 Bhampura, Bampur.
 Bharnch, Baroach.
 Bhāta, India.
 Bhavāul, Umā.
 Bheel, India.
 Bhel, Bael.
 Bhevaunee, Bhowan.
 Bhisu, Bilsa.
 Bhovani-Kudar, Bhavani-Kudar.
 Bhungsaur, Allahabad.
 Bla (r.), Oh.
 Blafu glacier, Tibet.
 Biologrod, Akjermann.
 Bialy, Bialystok.
 Bianson (r.), Var.
 Bibawan, Atlas Mt.
 Bible Christians, Methodists.
 Bible Communists, Perfectionists.
 Bihorate of soda, Borax.
 Bibracte, Autun.
 Biceps muscle, Hand.
 Bichacz, Bihacz.
 Biehr, Polypterus.
 Bicker, Bunker.
 Bidouze, Pyrénées, Basses.
 Biela, (r.), Bohemia.
 Bielaga, Sturgeon.
 Biélala (r.), Timur, Ufa.
 Bielo, Novgorod.
 Bielslein, Bielschöble.
 Bèvre, Seine.
 Bighorn, Argali, Sheep.
 Big Laurel, Magnolia.
 Bignollia, Alpes, Basses.
 Big Sandy River, Tennessee.
 Big Vermillion (r.), Wabash.
 Bijaga (l.), Blasagos.

Bikkhu, Buddhism.
 Billa, Billu.
 Bilbilla, Calatayud.
 Bilharzia, Trematoda.
 Billing, Reformation.
 Bilious Fever, Typhus and Typhoid
 Fever.
 Bill-book, Book-keeping.
 Bill of Palus and Penalties, Bill of At-
 tainder.
 Bill of Portland, Portland Is.
 Bille, Denmark.
 Billows Falls, Vermont.
 Bills (in part.), Parliament.
 Bimah, Kistna.
 Bimo, Sumbawa.
 Bindloes (l.), Galapagos Is.
 Bingerloch, Bingen.
 Blugol-su, Aras.
 Binnen, Bay of, Amboyna.
 Binny, Barbel.
 Binue, Beue.
 Bipinnate, Leaves.
 Birbhoom, Beerbhoom.
 Birch-oil, Birch.
 Birch-tar, Birch.
 Bird (l.), America.
 Bird (l.), Chaco Islands.
 Bird-mite, Episoa.
 Birch-jik, Bir.
 Biren, Biron.
 Bir-es-seba, Beersheba.
 Biretum, Vestments.
 Birgus, Purple-crab.
 Biribi, Rouge-et-noir.
 Birkenfeld, Oldenburg.
 Birket-el-Kerun, Maria, L.
 Birket-el-Mariut, Marootia.
 Birlaw, Byrlaw.
 Birs Nimrud, Pyramid.
 Birth, Berta.
 Bisanagar, Bishnuggur.
 Blacoe's Range, Graham's Land.
 Biscuit Root, Quamash.
 Biserta (l.), Tunis.
 Bishari, Africa, Nubia.
 Bishop-Wearmouth, Sunderland.
 Bishop-weed, Gout-weed.
 Blasayas, Philippine Islands.
 Bisulphide of carbon, Sulphur.
 Blautun, Behistun.
 Bismamtri, Baroda.
 Bisternate, Leaves.
 Bitlis (r.), Tigris.
 Bitolia, Monastir.
 Bitto-tree, Hajili.
 Bittacle, Binnacle.
 Bitter apple, Colocynth.
 Bitter cucumber, Colocynth.
 Bitter (l.), Suez.
 Bitter liquid, Bittern.

- Bitter of senna, Cathartine.
 Bitter waters, Mineral waters.
 Bjelbog, Slaves.
 Black (i.), Ross & Cromarty.
 Black (i.), Polynesia.
 Black (int.), * Montenegro.
 Black (r.), Jamaica.
 Black (r.), Mississippi.
 Black (r.), Niger.
 Blackadder (r.), Berwickshire.
 Black-ash, Soda.
 Blackblue, Buckwheat.
 Blackbird, Moor, Ring Ouzel.
 Black Country, West Bromwich.
 Black cumin, Cockle.
 Black Down, Mendip Hills.
 Black draught, Magnesium, Senna.
 Black-eyed pea, Dolichos.
 Blackfish, Tantog.
 Black grain, Kidney-bean.
 Black goose, Brent Goose.
 Black grouse, Blackcock.
 Black Hawk War, U.S.
 Black helmet, Cameo.
 Black lark, Dumfriesshire.
 Black leg, Black Quarter.
 Black locust, Honey Locust Tree.
 Black oak, Quercitron.
 Black orang, Chimpanzee.
 Black Russia, Lithuania.
 Black saltwort, Glimx.
 Black Saturday, Perth, Five Articles of.
 Black-shouldered hawk, Elanet.
 Black spald, Black Quarter.
 Black squitch, Bent Grass.
 Blackstairs (int.), Wexford.
 Blackstone (r.), Woonsocket.
 Black tang, Wrack.
 Black Town, Bombay.
 Black varnish tree, Melanorrhæa.
 Black vomit, Yellow Fever.
 Black vulture, Carrion Crow.
 Blackwater, Essex.
 Blackwater, Overysel.
 Black whale, Cæling Whale.
 Blackwood, Rosewood.
 Blad-el-Djerid, Algeria.
 Bladenoch (r.), Wigtown.
 Blair-Drummond, Bog.
 Blanch Town, South Australia.
 Blankeustein, Blankenburg.
 Blanquette, Sprat.
 Blanquilla, Antilles.
 Blantyre, Lord, Stewart Family.
 Blasquets, Kerry.
 Blastema, Cells.
 Blau (r.), Ulm.
 Blauw, Blau.
 Blavia, Blaye.
 Blaze, Brash.
 Blazing star, Melanthaceæ.
 Bleeding, Venesection.
 Bleiberg, Bleibach.
 Bleking, Carlskrona.
 Bligham (i.), Windermere.
 Blenny, Nubia.
 Bleuch holding, Blanch.
 Blennorrhæa, Gonorrhæa.
 Bleone, Durance.
 Blera, Gravina.
 Blessington, Earls of, Stewart Family.
 Bleu de Paris, Dye-stuffs.
 Blewfields, Nicaragua.
 Blimbing, Carambola.
 Blind Bay, Nelson.
 Blindbelm, Blenheim.
 Blind rat, Mole-rat.
 Blister copper, Electro-metallurgy.
 Blistering agents, Vesicants.
 Blistering paste, Cantharis.
 Bloaters, Herring-Fishery.
 Bloem Fontein, Orange River Free State.
 Blonde, Chantilly.
 Blood feud, Vendetta.
 Blood-letting, Venesection.
 Blood-striking, Black Quarter.
 Bloodworm, Midge.
 Bloody Council of the Netherlands, Alha.
 Bloody urine, Red Water.
 Blooms, Iron.
 Blossom, Flower.
 Blower, Spinning.
 Blowing Cave, Virginia.
 Bluebell, Harebell.
 Blue-bottle, Centaurea.
 Bluebreast, Blinethroat.
 Blue-checked honey-eater, Blue-eye.
 Blue gum, Tasmania.
 Blue light, Bengal Light.
 Blue light, Federalist, Republican.
 Blue Mull Sound, Yell.
 Blue wren, Malurus.
 Blunderville, Veterinary Medicine.
 Boarding, Board.
 Board of Green Cloth, Steward of the Household.
 Boat-fish, Dory.
 Boat-tail, Quiscalus.
 Boavista, Cape Verd Islands.
 Bobatays, Rigging.
 Boca Cognito, Atrato.
 Boca del Drago, Dragon's Mouth.
 Bocland, Bockland.
 Boco, Capo, Sicily.
 Bode (r.), Bielsböld.
 Bodjong, Samarang.
 Bodrog (r.), Theise.
 Boel, Engraving.
 Bog (r.), Bug.

- Bogdo-lama, Lamaism.
 Bogdshé-Adassl, Tenedos.
 Boghas, Samos.
 Boghead coal, Torbanehill Mineral.
 Boghra (mts.), Cork.
 Bogles, Goblins.
 Bog orchis, Bryophyllum.
 Bogue, Bocca Tigris.
 Bohemian Deists, Abrahamites.
 Bohemian glass, Cassius, Purple of
 Böhmerwald, Bohemia.
 Bohodukhov, Bogodoukhov.
 Boidæ, Boa.
 Boiling-point, Thermometer.
 Boisdale (l.), Uist.
 Bois de Chypre, Cordiacæ, Elm.
 Bolium, Doris.
 Bojabs, Nubia.
 Bojana (r.), Scutari.
 Bökcl, Beukelzoou.
 Bola, Hibiscus.
 Boldu, Monimiacæ.
 Bolivar, New Grenada.
 Bull, Lettuce.
 Bolar-tag (mts.), Turkestan.
 Bolsec, Jerome, Calvin.
 Bollswert, Engraving.
 Bolt-bar, Lace.
 Bolton, Captain, Signale.
 Boly, Boll.
 Bomarsund, Aland Is.
 Bombay duck, Bummalotti.
 Bombell, Algebra.
 Bomb-ketch, Bomb-vessel.
 Bombus, Humble-bee.
 Bombycidæ, Silk & Silk-worm.
 Bombycilla, Wax-wing.
 Bon, Cape, Africa, Tunisia.
 Bona Bona, Bola Bola.
 Bonacca, Bay Is., Ruatan.
 Bonaccio, Algebra.
 Bon Air, Buen Ayre.
 Bonaparte, Ile de, Réunion.
 Bona Vista, Newfoundland.
 Boucherie process, Wood preserving.
 Bond of presentation, Caution, Judicial.
 Bonduc, Guilandina.
 Bone-bed, Lias.
 Bone-cave, Kent's Cavern.
 Bone-earth, Bone-ash.
 Bonelli, Telegraph.
 Bone-oil, Tar.
 Bones, Borrowstownness.
 Bonhard, Bonyhad.
 Boniface (governor of Africa), Rome, Valentinians.
 Bonington, Painting.
 Bonmahon, Waterford.
 Bonnet, Fortification.
 Bonnet (r.), Lettrim.
 Bonnet limpets, Calyptrae.
 Bonnet-piece, Numismatics.
 Bonneville, Savoy.
 Bonnitou Linn, Clyde.
 Bonny, Niger.
 Bonplandia, Angostura Bark.
 Boute Quagga, Dauw.
 Bony, Boul.
 Boobialla, Tasmania.
 Book-madness, Bibliomania.
 Book of Sports, Sports, Book of.
 Book scorpion, Chelifer.
 Book-society, Book-club.
 Boolak, Boulac.
 Bool-work, Buhl-work.
 Boomkin, Bamkin.
 Boondee, Baudi.
 Bootan, Bhotan.
 Booth, John Wilkes, Seward, U. S.
 Bootkin, Boot.
 Boots, Shoes.
 Booty, War-Services.
 Bora, Alps.
 Bora-Bora, Bola Bola.
 Bora-dagh (mts.), Albania.
 Borate of lime, Hayasine.
 Borcetta, Birtscheid.
 Borden, Anatomy.
 Border (Heraldry), Bordure.
 Bordoe, Faroe Isles.
 Bordone, Ambrogio, Giotto.
 Bore, Bristol Channel, Hang-Chow-foo.
 Boreal Crown, Aurora.
 Borecole, Kale.
 Borer, Hag.
 Borgholm, Oeland.
 Boronone, Painting.
 Borlazzo, Iseo. (l.)
 Bormida, Po.
 Borne, Bourbonne-les-Bains.
 Borocalcite, Hayasine.
 Borofak, Borovak.
 Borolime, Brian Borolime.
 Borrowdale, Keswick.
 Bort, Diamond.
 Borythenes, Dnieper.
 Bos, Jungly Gau.
 Bos Arnee, Arnee.
 Bos brachyceros, Zaimouse.
 Bosch Vark, Wart-hog.
 Boshes, Blast Furnace.
 Bosjesman's (r.), Bushman's River.
 Bosna (r.), Turkey.
 Bosok, Anatolia.
 Bosporous, Kerch.
 Boston Port Bill, U. S.
 Bűszormeny, Haiducks.
 Botany Bay Kino, Eucalyptus.
 Botaurus, Bittern.
 Bothriocephalidæ, Tapeworm.

- Botley Hill, Downs, Surrey.
 Botrophis actæoides, Actæa.
 Botekay, Transylvania.
 Botta, Buccino.
 Botticelli, Engraving.
 Bottlehead, Dolphin.
 Bottle-nosed whale, Bottle-head.
 Bouched, Gun.
 Boucher, Engraving.
 Boudroun, Boudroom.
 Bonlac, Boolak.
 Bound, Dr. Nicolas, Sabbath.
 Bounty, Mutiny of, Bligh, W.
 Bourbon l'Archambault, Allier.
 Bourbon-Vendee, Napoleon Vendee.
 Bourg, Ain, Ardeche.
 Bourgaenaf, Cruse.
 Bourgeois, Type.
 Bourse, Broussa.
 Bourun, Boodroom.
 Bonssac, Crense.
 Bout-du-monde, Cascade of, Savoy.
 Bouza, Abyssinia. Beer.
 Bovcle, Rhinoceros.
 Bovey-coal, Brown Coal.
 Boville, Marino.
 Bow, (r.), Saskatchewan.
 Bow-chaser, Chase.
 Bowen, Queensland.
 Bowfell, Westmoreland.
 Bow man's root, Gillenia.
 Bow-window, Bay-window.
 Bow-wow Theory, Onomatopœia.
 Box-tortoises, Chelonia.
 Boyaca, New Grenada.
 Boyana, (r.), Bosnia.
 Boyar, Bojar.
 Boyce, Boeca.
 Boyle, Plain of, Roscommon.
 Boyne, Banffshire.
 Boyne (r.), Queensland.
 Bozrah, Edom.
 Brabourne, Sabbath.
 Bracadale (l.) Skye.
 Brachiale, Brassarts.
 Brachionna dorcas, Rotatoria.
 Brachirus, Sole.
 Brachycephalus, Skull.
 Brach-y-Pwll, Cardigan Bay.
 Bracken, Brake.
 Bracklesham beds, Bagshot Beds.
 Bracks, Braxy.
 Bractea, bracteoles, bractlets, Bract.
 Braeriach, (mt.), Dee.
 Draganza, Braganza.
 Bragg, General, U. S.
 Brahe (r.), Vistula.
 Brahmadruda oil, Caruku Oil.
 Brahmanas, Veda.
 Brahmany kite, Erne.
 Brahmin, Brahman.
 Brahminy bull, Zebu.
 Braid, Mr., Animal Magnetism.
 Braik, Braxy.
 Bralioff, Brailov.
 Brain, diseases of.
 Brain-fever, Brain, Typhus and Typhoid fevers.
 Brake, Flax-dressing.
 Bruma Rail, Chetodontidae.
 Brambanam, Indian Architecture.
 Bramber, Rape of, Sussex.
 Brancher, Falconry.
 Branchie, Gills.
 Branchiostegal rays, Fishes.
 Brancarsine, Acanthus.
 Brandano, Basilicata.
 Brandon (mt.), Kilkenny.
 Brandt, Struensee.
 Brandywine, Pennsylvania.
 Branecki, Targowitz.
 Brauke, Mumps.
 Branning, Leather.
 Bras d'Or, Nova Scotia.
 Brass Instruments, Wind Instruments.
 Brasso, Cronstadt.
 Brass soldering, Brazing.
 Brassy, Bib.
 Bratish, Chub.
 Brathay (r.), Windermere.
 Brattocks, Eider.
 Brava, Cape Verd Islands.
 Bray, Wicklow.
 Brazelein, Brazil Nuts.
 Brazilian Eagle, Eagle Hawk.
 Brazilian Plum, Hog Plum.
 Brazilian ten, Gervas.
 Brazil Plum, Araucaria.
 Brda, Montenegro.
 Bread, Unfermented, Unfermented Bread.
 Bread, unleavened, Unleavened Bread.
 Bradalbane, Perthshire.
 Bread-mt, Cow Tree.
 Bread-plants, Cerealia.
 Bread-root, Psoralea.
 Bread-tree, Zamin.
 Bread-trees, Caffer Bread.
 Break-bone fever, Dengue.
 Breakspere, Nicolas, Adrian.
 Breast-wheel, Water-power.
 Brechan, Gulf of, Corrievrekin.
 Breckenridge, John C. U. S.
 Brechnock, Brecon.
 Breton Hills, Worcestershire.
 Breeze, Bot.
 Brege, Danube.
 Brehou Laws, Irish Lang.
 Brembo, Bergamo.
 Brenta, Austria.
 Brent barnacle, Barnacle Goose.
 Brentella, Cittadella.

- Brent Goose, Barnacle Goose.
 Bressuire, Sèvres, Deux.
 Bressumer, Breast-summer.
 Brethren of Social Life, the Common
 Lot, or of Good Will, Brotherhoods,
 Rellig.
 Brethren of the Sword, Teutonic
 Knights.
 Bretwalda, Anglo-Saxons.
 Breven (mt.), Chamouuil.
 Brevet, War Services.
 Brevier, Type.
 Briançon chalk, Steatite.
 Briançon manna, Larch.
 Bride, St. Bridget, St.
 Bridge of Boats, Bridge, Millit.
 Bridges, suspension, Suspension Bridges
 Bridgetown, Barbadoes.
 Bridgetown, Totnes.
 Brielle, Briel, Holland, South.
 Brienne-Napoleon, Brienne-le-Château.
 Brieve, Breve.
 Bric, Mosselle.
 Brigach, Danube.
 Brigg, Glanford Brigg.
 Bright, Sir Charles, Telegraph.
 Brighelmstone, Brighton.
 Brigitte, Bridget.
 Brihuega, battle of, Vendome.
 Brill, the, Briel.
 Brilliant, Type.
 Brilliant, Diamond.
 Brimstone Hill, Christopher, St.
 Brinjal, Egg-plant.
 Brioude, Loire, Haute.
 Brisbane, Moreton Bay.
 Brisbane, (r.), Queensland.
 Brisé, Brizeze.
 Bristol, Rhode Island.
 Bristol Bay, Alaska.
 Bristol brass, Alloy.
 Brisures, Abatement.
 British America, America, British.
 British Channel, English Channel.
 British Columbia, Canada.
 Britons, Celtic Nations.
 Britzschka, Coach.
 Brivas, Brioude.
 Brive, Correze.
 Brixham Cave, Torquay.
 Brize, Brizure.
 Broach, Baroach.
 Broad Bay, Lewis-with-Harris.
 Broad Church, England and Ireland,
 Church of,
 Broadford, Skye.
 Broadstairs, Thanet.
 Broadstone, Cromlech.
 Broadway Hill, Coteswold.
 Broad Pass, Burenda Pass.
 Broche, Broach.
 Brochel Castle, Raasay.
 Brock, Badger.
 Brock, General, U. S.
 Brocket, Stag.
 Broglie, Seven Years War.
 Brogue, Brog.
 Broken Bay, Hawkesbury.
 Bromberg, Posen.
 Bromus, Bromo-grass.
 Bronchocele, Throat.
 Bronzed skin disease, Suprarenal Cap-
 sules.
 Bronzite, Diallage.
 Brookwood, Plumetuel.
 Brora (r.), Sutherland.
 Brosimum, Bread-ant.
 Brosimus, Torsk.
 Brosna (r.), Shannon.
 Brothers of Christian Schools, Schools,
 Brothers of Christian.
 Brothock, Arbroath.
 Brougham, Coach.
 Brouwer, Brauwer.
 Brow-ague, Hemicrania.
 Brown, John, Sabbath.
 Brown (mt.), Columbia, British, Rocky
 Mountains.
 Brown Bess, Rifled Arms.
 Brown hemp, Suun.
 Brown ptarmigan, Moorfowl.
 Brown University, Rhode Is.
 Broye, Freiburg.
 Bruck, Brugg.
 Brude, Picta.
 Bruggemann, Hans, Carving.
 Bruhma, Brahma.
 Bruisers, Crushers.
 Brum, Gomuto.
 Brummagem, Birmingham.
 Bruu, Burnley.
 Bruna (r.), Castiglione, L. of.
 Brunai (r.), Borneo.
 Brunanburgh, battle of, Scotland.
 Brundisium, Brindisi.
 Brunjuke, Broussa.
 Brusa, Bithyria.
 Brusche (r.), Strasbourg.
 Brush turkey, Talegalla.
 Brussa, Anatolia.
 Brussels-point, Lace.
 Bruttians, Rome.
 Bryanites, Methodists.
 Bryge-bot, Trinoda necessitas.
 Bryher, Scilly Islands.
 Bubastis, Egypt.
 Bubastis agria, Belbeya.
 Bubble-shells, Bulla.
 Bubucle, Whelk.
 Buccinari (l.), Caprera.
 Bucco, Atellana.
 Buceros, Hornbill.

- Buchan, Earls of, Stewart Family.
 Buchan Deeps, Buchan-Nees.
 Bucuatic Islands, Bonifacio, Strait of.
 Buck, Fallow Deer.
 Buck-eye, Horse-chestnut.
 Bucket fever, Dengue.
 Buckie, Banffshire.
 Buckle, Wheel.
 Bucking, Bleaching.
 Buckingham, Duke of, Richard III.
 Bucksport, Penobscot.
 Bucktails, Republican.
 Budd, Dr. William, Typhus and Typhoid Fevers.
 Buddhism, Ceylon.
 Buddie, Tin.
 Bude, Gull., Budeus.
 Budissin, Bautzen.
 Budjak, Bessarabia.
 Budukishan, Badakhehan.
 Budytes, Wagtail.
 Buech, Duraue.
 Buena Vista, battle of, Taylor, Zachary, U. S.
 Buffalo (r.), Kaffraria, British, Natal.
 Buffalo-fish, Chætodontidæ.
 Buffel-headed duck, Garrot.
 Bufo and Bufonidæ, Toad.
 Bugio, Desertas.
 Bugis, Borneo.
 Bugle horn, Hunting horn.
 Bulk (r.), Kishenan.
 Bullith, Brecknockshire.
 Bultenzorg, Java.
 Bukharest, Bucharest.
 Bukharia, Little, Turkestan.
 Bukke Fiord, Carmoe.
 Bulgarians, Cathari.
 Bulge, Bilge.
 Bulbani, Bondon.
 Bull, sacred, Zebu.
 Bulla, Seal.
 Bullion bar, Glass.
 Bullock's heart, Custard Apple.
 Bull of the bog, Bittern.
 Bull Run, U. S.
 Bull Run (mt.), Virginia.
 Bull's mouth, Cameo.
 Bully-tree, Ballet-tree.
 Bultistan, Tibet.
 Bum-bailiff, Bonnd-bailiff.
 Bum-bee, Humble-bee.
 Bunas, Banas.
 Buocrana, Swilly, Loch.
 Bundelcund Hills, India.
 Bundemeer, Fars.
 Bunder Abbas, Gombroon.
 Bugarus, Bougar.
 Bunker's Hill, Boston.
 Bunsen-burner, Warming, &
 Buoyancy, Hydrostatics.
 Buoy, Lighting of Beacons, &c.
 Burada, Barrada.
 Budhuret, Bay Islands.
 Burdekin (r.), Queensland.
 Bureaucracy, Bureau.
 Bu-Regreb (r.), Rabat.
 Burette, Volumetric Analysis.
 Burg, Femern.
 Burg, Leyden.
 Burg, burgh, Berg.
 Burg-bot, Trinoda necessitas.
 Burghaz, Burgas.
 Burghhead, Elginshire.
 Burgher, Burgess.
 Burgher Synod, U. P. Church.
 Burgh-Mouan, Monea.
 Buriats, Siberia.
 Burlus, Chizerote.
 Burke, R. O'Hara, Australian Explorations.
 Burke and Hare, Anatomy.
 Burlaw, Byrlaw.
 Burler, Woollen and Worsted Manufactures.
 Burlington, Iowa.
 Burnoose, Beduin.
 Burnside, General, Richmond, U. S.
 Burr, Aaron, U. S.
 Burra, South Australia.
 Bursche, University.
 Burslem, Stoke-upon-Trent.
 Burtali, Mango Fish.
 Burton, Henry, Sabbath.
 Born, Moluccas.
 Burunhem, Buranhem.
 Burwell, Erie, Lake.
 Busaquino, Busachino.
 Busento, Cosenza.
 Bush (r.), Anthr.
 Bush-cat, Serval.
 Bush-cow, Zamouse.
 Bushehr, Abushehr.
 Bush-hog, Hog.
 Bush-key, Tortugas.
 Busiris, Pyramid.
 Bussora, Bassora.
 Bustian-foul, Rheumatism.
 Bute, Earls and Marquises of, Stewart Family.
 Buteo, Buzzard.
 Bûtom, Benthon.
 Butt, Leather.
 Butter-and-tallow tree, Pentadema, Tallow Tree.
 Butter bar, Tusillago.
 Butter-nuts, Caryocar.
 Buttes (mt.), Sierra Nevada.
 Button snakeroot, Eryngo.
 Batty gangs, Railways.
 Byzacium, Barbary.
 Bzewieski, Targowitz.

- Caama, Kaama
 Cabades, Sassanides
 Cabbage-tree, Andira
 Caboolture, Moreton Bay
 Cabotsville, Chicopee
 Cabree, Prong-horn
 Cabrera, Cabral
 Cabriole, Coach
 Cabrit, Prong-horn
 Cacolet, Ambulance
 Cadaburi (r.), Rio Negro
 Cad-hait, Caddice
 Cader Fromwen, Denbighshire
 Cadesia, battle of, Sassanides
 Cadge, Falconry
 Cadvalonga, Cathalogan
 Cælebs, Chaffinch
 Cælienterata, Radiata
 Cællan Hill, Rome
 Caer-Gwent, Winchester
 Caer-Selout, Caernarvon
 Casarea Augusta, Saragossa
 Cassarion, Cleopatra
 Cæstum, Rubidium
 Cæsius, Blau
 Cæstus, Cestus
 Cæte, Cabôte
 Calman, Alligator
 Caluites, Calu
 Cairngorm, Aberdeenshire, Banffshire,
 Grampians
 Cairnharrow, Kirkcudbright
 Cairnsmore, Kirkcudbright
 Cairntoul, Aberdeenshire
 Cairo, Illinois
 Caffè (r.), Bragança
 Calthness, Earls of, Sinclair Family
 Cajetan, Boniface, Pope
 Calacalla, Chili
 Caladium, Brazil Cabbage
 Calah, Assyria
 Calappa, Cocoa-nut
 Calaveras, Mammoth trees of, Welling-
 tonia
 Calavon, Durance
 Calbe, Kalbe
 Calcareous alabaster, Calcsinter
 Calcraft, Executioner
 Calc-spar, Calcareous Spar
 Calc-tuff, Calcareous Tuff
 Caldecot, Monmouth
 Calder, Colne
 Caldera, Chili, Volcanoes
 Calderoon, battle of, Selim I.
 Caldeas, Caldas
 Caldew, Carlisle
 Caldwell, C. Phrenology
 Caledonians, Celti-Nation
 Calela, Casacalenda
 Calépine Lexicon, Faccioliati
 Calf of Man, Mau, Isle of
 Calico bush, Kalma
 Calidrie, Sanderling
 Californian vulture, Condor
 Calligæ, Fish-louse
 Callope (r.), Queensland
 Callisaya bark, Cluchona
 Calixtus III. Borgia
 Callan, Arinagh, Kilkenny
 Callan, Mount, Clare
 Calcedra wood, Flindersia
 Calloma, El Dorado
 Callon, Sculpture
 Calmout Creek, Sierra Leone
 Calmout (r.), Mayenne
 Calocephalus, Seal
 Colonyction, bona nox, Belle de Nuit
 Caloo-sa-hatchee, O-kee-choo-bee
 Calore, Beuevento
 Caltagirone, Calatagirone
 Caltaro, Dalmatia
 Calvert, Ralsley, Wordsworth
 Calvi, Corsica
 Calvaistic churches, Reformed
 Churches
 Canaleu gris, Manuscripts
 Camassia, Quamash
 Cambo, Pyrenees, Basses
 Cambodia (r.), Cochlin China
 Camboja, Cambodia
 Camboose, Caboose
 Camden Fort, Convict
 Camden Society, Rox. Club
 Camel (r.), Cornwall
 Camerlengo, Cardinal
 Camille, Cordeliers
 Camirus, Rhodes
 Camowen (r.), Tyrone
 Campanella, Cape, Capri
 Campendor, Cld Campsador
 Campelophilus, Woodpecker
 Camp fever, Typhus
 Camphlene, Camphene
 Campinas, Rio Grand du Sul
 Campine, Belgium, Gheel
 Campo Felice, Italy
 Camulodunnun, Malton
 Canaan, Phenicia
 Canada Creek, West, Trenton Falls
 Canadian boat-song, Ottawa
 Canadian hemp, Apocynaceæ, Dogbane
 Canadian rice, Cerealia, Rice
 Canale, Canaletto
 Canaudaigua (l.), Susquehanna
 Canarese language, Tamil
 Canatix, Felandische
 Cancer, Chimney-sweepers', Soot
 Cancer of the stomach, Stomach
 Cancer of the womb, Womb, Diseases,
 &c., of the
 Canche, Pas-de-Calais
 Cancroun, Boatbill

- Cancrum oris, Mouth
 Cause straw or trash, Bagnasse
 Cauha, Extremadura
 Canicula, Sirius
 Canje, Guiana, British
 Canker, Mouth
 Canua, Cana
 Cannaceæ, Marantaceæ
 Cannon, Billiards
 Cannon, War-services
 Cannon boue, Ruminantia
 Canuor (l.), Crannoges
 Canobus, Canopus
 Canon, Type
 Canonisation, Saints
 Canons, Regular Canons
 Canque, Cang
 Canso, Tronbadour
 Cantabria, Basque Provinces
 Cantago, Costa Rica
 Canterbury, Archbishop of, Archbishop
 Cantharides plaster, Vealcants
 Cantharus, Scarabeus
 Cantilver, Cantilver
 Canto, Rhupodists
 Canto Fermo, Plainsong
 Canto (r.), Bayamo
 Cant-timbers, Shipbuilding
 Cantu, Canturio
 Canvas (in painting), Painting
 Canvas-back duck, Pochard
 Caouana olivacea, Turtle
 Capac (Munco, Huayna, &c.), Peru
 Capana, Monte della, Elba
 Cape ash, Meliaceæ
 Cape Cdd Bay, Massachusetts Bay
 Cape Fear River, Carolina, N.
 Cape guevel, Kleene Boc
 Cape of Good Hope, Papua
 Cape sheep, Albatross
 Capitation grant, Volunteers
 Capitation tax, Richard II.
 Capitulum, Rome
 Cap la Rocca, Portugal
 Capnio, Reuchlin
 Cap of dignity, Maintenance, Cap of
 Capollin, Cherry
 Capoguin, Waterford
 Capra, Capella
 Capreolus, Roe
 Caprus, Boar-fish
 Caprylic acid, Capric acid
 Caprella, Shepherd's Purse
 Capsular, Ligaments
 Capueta, Japura
 Carabineers, Carbineers
 Carabost, Skye
 Caraccioli, Alfonso V. of Aragon
 Caracoi, Guayaquil
 Caradoc, Welsh Lang & Lit.
 Caradrina, Willow-moth
 Caramania, Karaman
 Caranbole, Billiards
 Caranaiba Palm, Carnahuba Palm
 Carapano, Cumana
 Carapata, Tick
 Carausius, Saxons
 Caravats, Ribbonism, White-boy
 Carbo-hydrates, Vegetable Chemistry
 Carbonates, Carbolic Acid
 Carbnrets, Carbides
 Carcaso, Carcassone
 Carcavela, Rattlesnake
 Cardener (r.), Cardona
 Carder, Woollen and Worsted Manu-
 factures
 Carders, Ribbonism
 Cardigan B., Fr. Edward Is
 Cardinal (beverage), Bishop (beverage)
 Cardinal de Lugo's powder, Ciuchona
 Cardiopermum, Supindaceæ
 Cardonet, Mauresa
 Carduchi, Druses, Kurdistan
 Carduells spinus, Aberdevine
 Caremata Passage, Billiton
 Caretta, Tortoiseshell, Turtle
 Carham Burn, Border
 Caribou, Reindeer
 Caribs, Christopher's, St
 Caricinee, Cyperaceæ
 Caries of the teeth, Tooth
 Carigliano, Muscatel
 Carina, Papillonaceæ
 Carisbrooke Castle, Wight, Isle of
 Carjacou, Cariacou
 Carle Sunday, Care Sunday
 Carlingford Bay, Down
 Carlingford (mts.), Louth
 Carlisle Bay, Barbadoes
 Carloman, Carolingians
 Carlaten, Sweden
 Carlyle Fort, Convict
 Carmanlia, Kerman
 Carmathians, Kurmathians
 Carminatives, Narcotics
 Carnedd-Llewellyn (mt.), Snowdon
 Carnsore Point, Wexford
 Carolina catchfly, Dionaea
 Carolina parrot, Macaw
 Carolina rail, Crane
 Caroni, Orinoco
 Carpal bones, Hand
 Carpat, Carpathian Mts.
 Carpathos, Scarpanto
 Carpi, Transylvania
 Carpophore, Umbelliferae
 Carr, Viscount Rochester, Overtury,
 Sir T.
 Carran-tual, Magillycuddy Reeks
 Carrara-water, Aërated Waters
 Carrera, Rafael, Guatemala
 Carriacou, Grenadines

- Carrick, Ayrshire
 Carrick-beg, Waterford
 Carrick Road, Cornwall
 Carrion-bird, Jay
 Carrot-fly, Carrot
 Carrotling, Fur
 Carrying-trade, Carriers
 Carson City, Nevada
 Carson's (r.), Washoe
 Cart, Black (r.), Renfrew
 Cart, White (r.), Renfrew
 Carte, Fencing
 Carter, Dr. Parasitic Diseases
 Carter Fell, Cheviot Hills
 Carthamus, Safflower
 Carthusian Powder, Kermes Mineral
 Carton-Pierre, Papier-mache
 Cartridge, Snider, Breech-loading
 Arms
 Carum, Caraway
 Caryll, Crall
 Carystos, Eubœa
 Cascade (mts.), Oregon
 Cascade City, Washington Territory
 Caselli, Telegraph
 Cashan (mts.), Transvaal Republic
 Cash-book, Book-keeping
 Cashen, Kerry
 Casherbox, Glass
 Cashmere (town), Serinagar
 Cask-bridge, Bridge, Mill
 Caskets (Rocks), Alderney
 Casinariuschus, Bell-bird
 Cassada bread, Manioc
 Cassia, oil of, Cinnamic Ac.
 Cassiripe, Casareep
 Cassis, Currant
 Cassis, Helmet-shell
 Cassiterite, Tin
 Cassowary tree, Casuarina
 Cassinunnar, Ginger
 Castalian Spring, Castri
 Castanum, Chestnut
 Castanulas, Castanets
 Castel, Château
 Castello, Monte-Catini
 Castello, Lago di, Albano
 Castelnau, Peter of, Albigenes
 Castel Nuova, Manduria
 Castel St. Angelo, Tomb
 Castine, Penobscot
 Castle Blayney, Monaghan
 Castlecomer, Kilkeenny
 Castlederg, Tyrone
 Castle Douglas, Kirkcudbrightshire
 Castle Harbor, Bermudas
 Castlemilk, Stuarts of, Stewart Family
 Castlora, Roscommon
 Castlereagh (r.), Darling
 Castleuart, Lords and Earls of, Stewart Family
 Castleton, Dundalk
 Castri, Delphi
 Castro, Chiloé
 Catacaustic, Canatic
 Cataract (mts.), U. S.
 Cat Bells, Derwentwater
 Cat Castle, Cat
 Catechist, Catechism
 Catesby, R. Gunpowder plot
 Cat-fall, Cat (shipboard)
 Catfish (r.), Four Lakes
 Cat-fish, Wolf-fish
 Cathariuen, Prunes
 Cat-harpings, Cat (shipboard)
 Cathartes, Vulture
 Cat-head, Cat (shipboard)
 Catharine wheels, Pyrotechny
 Catherine Archipelago, Aleutian Islands
 Catholic rent, Roman Cath. Emancipation
 Cat-hook, Cat (shipboard)
 Cat (l.), Bahamas, Guanaiani
 Catlaw, Forfarshire
 Cat's-foot, Cudweed
 Cat's gold, Mica
 Cat shirk, Cestracion
 Cat Stane, Standing Stones
 Cat's silver, Mica
 Catsup, Ketchup
 Cat thyme, Germanier
 Catwater, Plymouth Sound
 Caucl, Wicklow
 Caudal artery, Aorta
 Caupa, Orinoco
 Causality, Phrenology
 Cauterets, Pyrenees, Hantes
 Canterbury, Bleeding
 Caux (mts.), Seine-Inferieure
 Cavado (r.), Entre D. e Minho
 Cavallion, Vancluse
 Cavehill, Belfast
 Caveudish, Tobacco
 Caverns, Caves
 Cavour (town), Cavor
 Cawdor, Nairnshire
 Cawsand Bay, Plymouth Sound
 Cayambe, Andes
 Cayo Hueso, Key West
 Cayos, Calcos
 Cazanare, Boyaca
 Cazes, Turkey
 Cazique, Cacique
 Cedar, bastard, Toon
 Cedar of Goa, Cypress
 Cedar, white and red, Icica
 Cedrela angustifolia, Alliaceous Plants
 Cedrela Toona, Toon
 Cedron, Simarubaceae
 Cefalonia, Cephalonia
 Cefola, Sefula

- Celroq, Dee
 Celandine, Lesser, *Ranunculus*
 Celeric, Celery
 Celestial Mountains, Thian-Shan
 Cell, Grecian Architecture
 Cellular plants, Spiral Vessels
 Celtic, Society, Rox. Club
 Celts' pipes, Tobacco-pipes.
 Cement, Teeth
 Cemeteries, Sanitary Science
 Cenchrea, Corinth
 Cenchris, *Trigonocephalus*
 Ceus (mt.), Tunnel, Tunnel, Com-
 pressed Air-engine
 Centaurina, Centaury
 Centetes, Tenrec
 Centime, Cent
 Centner, Ton
 Central America, America
 Centrisca, Trumpet-fish
 Centrolophus, Blackfish
 Centropomus, Sea-pike
 Centuriatore, Magdeburg Centuries
 Ceos, Greece
 Cephalopus, Impoon, Kleene Boc
 Cephalothorax, Spider
 Cephasus, Attica, Boeotia, Orchomenos
 Cephus, Rotche
 Cephus pygmaeus, Sawfly
 Cerastium, Chickweed
 Cerasus, Cherry
 Carbera Tanghin, Tanghin
 Cereado, Guco
 Cereal grasses, Cerealia
 Cerebellum, Phrenology
 Cerebral hemisphere, Brain
 Ceret, Pyreæes Orientales
 Cerin, or Cerotic acid, Wax
 Cerue, Atlas Mt.
 Cernobog, Slaves
 Cerolein, Wax
 Cerro de Pasco, Pasco
 Cerro de Potosi, Andes
 Ceruminous glands, Skin
 Cervetri, Cervetere
 Cervino, Cardinal, Trent, C. of
 Cervo, Biella
 Cervus Canadensis, Wapiti
 Cestrotum, Cerostratum
 Cetonia, Rose Beetle, Turnip
 Cetrarine, Lichen
 Cettigne, Montenegro
 Cettina (r.), Dalmatia
 Cettinji, Montenegro
 Cevadic acid, Sabadilla
 Ceylon moss, Picaria
 Ceylon tea-tree, Elæodeudron
 Chabert, Animal heat
 Chaco, Paraguay
 Chad, St., Anglo-Catholic Church
 Chærophyllum tuberosum, Umbelliferae
 Chætogantha, Worms
 Chain-armor, Chain-mail
 Chained book, Book
 Chairs, railway, Railways
 Chaitya, Tope
 Chak-Chak, Pemba
 Chalcis, Cælo-Syria
 Chalcopyrite, Pyrites
 Chalk, red, Riddle
 Chalk formation, Cretaceous Group
 Chalk-stones, Uric Acid
 Chalonnais, Saône-et-Loire
 Chalybeates, Mineral Waters
 Chainba, Cashmere
 Chamber acid, Sulph. Acid
 Chambered limpet, Calyptraea
 Chambord, Renaissance
 Chamburn, Papaw
 Chamelcon silk, Taffety
 Chamelcon (r.), Honduras
 Chamomix, Chamomni
 Champ Leve, Euamel
 Chance, Messrs., Glass
 Chancellary, Chancery
 Chancellorsville, battle of, Rappahan-
 nock
 Chancres, Syphilis
 Chauderi, Chaudhaires
 Chaudragupta, India
 Chanson, Ring
 Chansons de Geste, Roland
 Chantaburi, Siam
 Chantelle-le-Chateau, Allier
 Chanter, Bagpipe
 Chao, Deserts
 Chaosyen, Corea
 Chaou-Chow, Chang-Chow-Foo
 Chapeau Bras, Hat
 Chapel-le-Frith, Derbyshire
 Chapman Barrow, Exmoor Forrest
 Chapoo, Hang-Chow-Foo
 Chappin, Chopin
 Charbou, Malignant Pustule
 Charette, Chouaus
 Chariot, Coach
 Charities, law of, Charitable Uses
 Charles (I.), Galapagos Is.
 Charles (r.), Cambridge
 Charles the Fat, Carolingians
 Charles II. Boscobel
 Charles IV. Capetian Dynasty
 Charles X., or Gustavus
 Charles XV. Sweden
 Charlock, jointed, Radish
 Charlotte-town, Grenada
 Charmonzie, Greece
 Charnwood Forest, Leicestershire
 Charollais, Saône-et-Loire
 Charta vesicatoria, Vesicants
 Chasc, Cider
 Chasseurs d'Afrique, Algeria

- Chasta (mt.), Rocky Mts.
 Châteaubriant, Loire-inférieure
 Château-chloun, Nievle
 Châtillon, Castelljo
 Châtel, Château
 Chatelain, Castellian
 Chateaudon, Puy-de-Dôme
 Chatham (I.), Galapagos Ia.
 Chate, Melon
 Chatl, Tiger-cat
 Chatoyant, Obsidian
 Chatraian, A. E., Erckmann
 Chataworth, Derbyshire
 Chatterton's compound, Telegraph
 Chattan, Clan, Totem
 Chattil, Catti
 Chaturaji, Cards
 Chaturpur, Bundelcund
 Chau-Chou, Swatow
 Chauci, Saxons
 Chaudière Falls, Ottawa (I.)
 Chaud-medley, Chance-medley
 Chauna, Screamer
 Clinvica, Betal
 Chebucto Bay, Canso
 Checkmate, Chess
 Chedabucto Bay, Canso
 Cheena, Millet
 Cheese (of thistles). Receptacle
 Cheese rennet, Bedstraw
 Cheesy metamorphosis, Tubercle
 Cheetham Society, Rox. Club
 Cheo Tor, Buxton
 Chega, Carlo, Gloggnitz
 Cheimatobia, Winter Moth
 Cheiron, Chiron
 Che-Keang, China
 Cheldir, Akhalzikh
 Chelmer (r.), Essex
 Chelmon, Archer-fish
 Chelonia imbricata, Tortoiseshell
 Chelsea Pensioner, Sulphur
 Chelt, Cheltenham
 Chemical equivalents, Atomic Weights
 Chemical physicians, Medicine, Hist.
 of
 Chemicking, Bleaching
 Chemnis, Ekhnim
 Chemung (r.), Elmira
 Chenalopez, Barnacle Goose
 Chennapatnam, Madras
 Chenoucaux, Renaissance
 Chenopodium album, Shagreen
 Cheops, Egypt, Pyramid
 Cheribon, Java
 Cheroot, Tobacco
 Cherry-brandy, Kirchwasser
 Chersonese, Heracleotic, Sebastopol
 Cherty, Chert
 Cherwell, Oxfordshire, Thames
 Chesil Bank, Portland Island
 Chessart, Cheese
 Chesterfield coal-field, U.S.
 Chevin, Chub
 Chewing of the cud, Ruminantia
 Chiari, battle of, Victor-Amadeus
 Chibchas, New Grenada
 Chichmech, Mexico
 Chickadee, Blackcap Titmouse
 Chickahay, Pascagoula
 Chickahominy (r.), Virginia
 Chickamauga, battle of, U.S.
 Chickrassia, Chittagong Wood
 Chilcotin, Fraser River
 Child-crowing, Thymus Gland
 Children, Parent and Child
 Chillasin, Millennium
 Chillicothe, Chillicothe
 Chilibuque, Auchenia
 Chilli pine, Araucaria
 Chilka, Cuttack, Ganjam
 Chilli, Chill
 Chillon, Seven Wise Men
 Chilopoda, Chilognatha
 Chimney swallow, Swift
 Chimney-sweepers' caucer, Soot
 Chinn-tai, Corea
 China-blue, Calico Printing
 Chincha (Is.), Peru
 Chincha bug, Epizoa
 China-felon, Rheumatism
 Chinese, Wigt (I.)
 Chinese arrow-root, Nelumbo
 Chinese fire, Pyrotechny
 Chinese sugar-caue, Durra
 Chinhal, Ningpo
 Chiuollue, Dye-stuffs
 Chiozza, Chloggia
 Chip, Pip
 Chipmuck, Squirrel
 Chippewa (r.), Wisconsin
 Chipping squirrel, Ground Squirrel
 Chipre, Cyprus
 Chiretta, Chirata
 Chirimoya, Cherimoyer
 Chirton, Tynemouth
 Chisels, Carpentry
 Chittah, Cheetah
 Chlamydosaurus, Agama
 Chloral, Alcohols
 Chloride of sulph. Sulphur
 Chlorocarbonic acid, Phosgene Gas
 Chloroform, Alcohols
 Chlorohydric acid, Hydrochloric Acid
 Chloromethyl, Methylene
 Chlorometry, Chlorimetry
 Chlorophyll corpuscles, Cells
 Chloroxylon, Satin-wood
 Chobanata (mt.), Samarkand.
 Chobe (r.), Zambesi
 Choctawhatchee, Florida
 Choczim, Chotyn
 Cholera, Sanitary Sc.

- Cholæpus, Sloth
 Cholula, pyramid of, Teocalli
 Cholulteca, Houduras
 Chondrology, Anatomy
 Chonka (r.), Ghogra
 Choo-Keang, Canton, China
 Choquard, Chocard
 Chorasnia, Khiva
 Chorisia, Silk-cotton
 Choroid, Eye
 Choroid plexus, Brain
 Chorolique, Nev. de, Andes
 Chota Valley, Andes
 Chott Melr'bir, Sahara
 Chotusitz, battle of, Succession Wars
 Chow, Heen
 Chowan, Carolina, North
 Chowries, Yak
 Chowringhee, Calcutta
 Christ Cross Row, Hornbook
 Christiana Creek, Brandywine Creek
 Christianshavn, Copenhagen
 Christians of St. John, Zabism
 "Christian Year," Keble
 Christmas, Gerard, Elizabethan Archi-
 tecture
 Christopher North, Wilson, John
 Chromatic aberration, Eye
 Chrome Yellow, Lead
 Cromogens, Secretion
 Chryselephantine statues, Sculpture
 Chryseus, Dhole
 Chrysobergos, Russian Church
 Chrysographi, Manuscripts
 Chrysolite, volcanic, Vesuvian
 Chrysomitris, Yellow-bird
 Chrysophrys, Gilt-head
 Chrysopolis, Ingolstadt, Scentaris
 Chucks, Turning
 Chuenpee, Bocca Tigris
 Chul. (r.), Semipalatinsk, Siberia
 Chulla (r.), Tomek
 Chulos, Bull-fight
 Chumalari, Himalaya
 Chumalen, Ghogra
 Chumie (r.), Kuffaria, Brit.
 Chundul (r.) Ganges
 Chuu Quoit, Cromlech
 Chupat, Patagonia
 Chuquibamba, Nevada de, Andes
 Chnquito, Chucnito
 Churchyard beetle, Blaps
 Churn (r.), Thames
 Churubusco, battle of, U. S.
 Chur-worm, Mole-cricket
 Chusau Han-tai, Amaranth
 Chuttees, Gunny Bags
 Chuttree, Casto
 Chwolson, Zabism
 Ciabese, Savoy
 Claran, Ireland,
 Clbao, Haytl.
 Clbber, Sculpture
 Cibol, Welsh Onion
 Cibotium, Pula
 Cibro, Cyprus
 Cicero, Type
 Cicester, Cirencester
 Cleonia argala, Argala
 Cidacos, Calaborra
 Cmandef, Bourbou, Ile de
 Cimolos, Greece
 Cimone (int.), Appennines
 Cinchona alkaloids, Quinia
 Cinchoula, Quinia
 Cinchoulaine, Quinia
 Cinchonidine, Quinia
 Cincinurus, Bird of Paradise
 Cincel Enna, Adamnau
 Cincture, Vestments.
 Cinnameline, Balsam
 Cinnamon, oil of, Cinnamic Acid
 Cinnamyl series, Cinnamic Acid
 Circle of Ulloa, Anthelia
 Circocela, Varicocela
 Circular Head, Tasmania
 Circular operation, Amputation
 Cirrhi, Cirrhopoda
 Cirrhosis, Liver, Diseases of
 Cirripeda, Cirrhopoda
 Cirro-cumulus, Clouds
 Cirro-stratus, Clouds
 Cirrus, Cirrhus
 Cirsum, Thistle
 Cirta, Constantine, Numidia
 Claspone cetobrix, Almaden
 Clatophorus, Wren
 Clithium, Larnica
 Clitoyen, Bourgeoisie
 Citrates of lime, potash, and ammonia,
 itric Acid
 Clitren, Lemons, oil of
 Clitrin, Rock Crystal
 Clitronyl, Lemons, Oil of
 Citrul, Melon
 Ciudad de Victoria, Durango
 Clive, Chive
 Clivet, Perfumery
 Clvitas, Rome
 Clvray, Vienne
 Claddagh, Galway
 Claddich, Awe, I.
 Cladonia, rangiferina, Reindeer Moss
 Claerwen, Brecknockshire
 Clain (r.), Vienne
 Clamecy, Nievre
 Clamps, Ship-building
 Clanis, Chluna
 Clare (r.), Corrib L., Tasm
 Clarence, Coach
 Clarence Peak, Fernando P.
 Clarence (r.), N. S. Wales

Clarias, Siluridae
 Clarimontium, Clermont
 Clark's process, Water-supply
 Clark's (r.), Tennessee
 Claspers, Fishes
 Claterna, Medicina
 Claudia gens, Appius Claudius
 Claudius Cæcus, Ap. Pyrrhus
 Claverhouse, Graham, John
 Clavier, Organ
 Clavigo, Compostella
 Clay-slate, Slate
 Clean Bill, Bill of Health
 Clear cole, Gliding
 Clearing, Wine
 Clearwen, Cardiganshire
 Cleave Hill, Coteswold
 Cleaving, Ploughing
 Cleddan, Pembrokeshire
 Cleesh Hills, Kinross-shire
 Clement, Clemens
 Clement VII., Pope, Schism, Western
 Clement's Strait, Billiton
 Cleobolus, Seven Wise Men
 Cleopatra's Needles, Alexandria
 Clerc-story, Clear-story
 Clergy, regular, Regulars
 Clergyman's sore throat, Throat
 Clerk Register, Lord, Register, Lord
 Clients, Rome
 Cliford Boat-lowering Apparatus
 Climate, Sanitary Science
 Clinch (r.), Tennessee
 Clingstones, Peach
 Clunker-built, Incher-built
 Clut Hill, Berwickshire
 Clinton, Iowa
 Clinton, Sir H. Andre, U. S.
 Clintonians, Republicans
 Clod-crusher, Roller
 Clod-fishing, Eel
 Clodius Albinus, Severus
 Clothing, Sanitary Science
 Clothing, army, War Services
 Clotho, Puff-adder
 Clotted Cream, Clotted Cream
 Clouet, François, Painting
 Clown, Forfarshire
 Clove pink, Carnation
 Clown, Harlequin
 Club Breton, Jacobins
 Club-root, Anbury
 Clubs, golf, Golf
 Club-shell, Clavagella
 Clugny, All-Souls' Day
 Clusium, Chiusi
 Clusius, Botany
 Clutha, New Zealand
 Clypeus, Shield
 Clyweddog, Dee
 Calcas, Thistle

Coal-naptha, Tar
 Coalsey, Coal-fish
 Coary (r.), Amazon
 Coast-guard, War Services
 Coast-rat, Mole-rat
 Coatzacoque, America
 Cobades, Sassanide
 Cobaltine, Arsenical Minerals, Pyrites
 Cobble, Coble
 Cobbold, Dr. Sclerostoma
 Cobbequid (mts.), Nova Scotia
 Cobham, Lord, Oldcastle, Sir John
 Cobs, Maize
 Coburg, Ontario
 Cocaigne, New Brunswick
 Cocculus, Guluncha
 Cochlearia, Snail
 Cock, J., Coccejus
 Cockburn Isle, Manitoulin Islands
 Cockburn Sound, Bnache
 Cockie, Warming and Ventilation
 Cock-metal, Alloy
 Cock of the rock, Rock, Cock of the
 Cock paidie, Lumpucker
 Cocktail, Rove Beetle
 Cock-up, Lates
 Coco, Cocoa, Samatra
 Cocoa-nut fibre, Coir
 Cocoa-root, Cocco
 Cocumigila, Cocomilla
 Cocus wood, Kokra Wood
 Codarinn, Tamarind
 Codbeck (r.), Thirst
 Code Henri, Christophe
 Codex Argenteus, Ulfilas
 Codex Aureus, Trèves
 Coendus, Porcupine
 Coffee-bug, Coccus
 Coffe-fish, Ostracion
 Coffin, Magdalen Island
 Coffre de Perote, Mexico
 Cognation, Aguato
 Cognomen, Name, Surname
 Collection of metals, Alloy
 Cohorn, Coehoorn
 Coire, Char
 Coirueig (l.), Skye
 Coir, Cerealia
 Coke-oil, Gas-tar
 Col, Con
 Colaba, Bombay
 Colair (r.), Ellore
 Colchicia, Colchicine, Colchicum
 Col de Tenda, Apennines
 Cold frame, Cold Pit
 Cold Harbor, battle of, U. S.
 Coldingham, Berwickshire
 Col-di-Tenda, Alps
 Colebrook, Fermanagh
 Colegates, Hops
 Coles, Capt., Turret-ship, Masts, (Iron)

- Colkitto, Crannoges
 Colla parte, Ad Libitum
 Collapse, Shock
 Collar-bone, Clavicle
 Collateral relationship, Consanguinity
 Collet, Colewort
 Collic, Shepherd's Dog
 Collier, Elisha H. Revolver
 Collimation, line of, Circle, Mural
 Collines Nantaises, Vendée, La
 Collodion, Photography
 Collodion cantharidis, Vesicants
 Collodium vesicans, Vesicants
 Colloids, Osmosis
 Collop Monday, Shrovetide
 Coin (r.), Thames
 Coine (r.), Buckinghamshire
 Colocasia macrorhiza, Tara
 Colombo, Calumba
 Colonel, War Services
 Colonial corps, War Services
 Colonus, Cape, Cortoné
 Colophonic acid, Rosin
 Colpetty, Colombo
 Col Roburent (mt.), Alps
 Coils, Pyrenees
 Colt, Colonel Samuel, Revolver
 Columbia, Tennessee
 Columbine, Harlequin
 Columbu, Colombo
 Columbus, Mississippi
 Comana, Bostan
 Coma vigil, Typhus and Typhoid
 Fevers
 Combativeness, Phrenology
 Comb-bar, Lace
 Comino, Malta
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 Draught, Draft
 Dravidian languages, Tamil
 Drawlug-slate, Chalk, black
 Drevet, Engraving
 Driu (r.), Albania, Bosnia
 Driuaasi (r.), Scentari
 Drinking insanity, Dipsomania
 Drinkwater, Colonel, Gibraltar
 Drolghneach, Irish Lang.
 Drome, M. de la, Weather
 Dromme, Calvados
 Drone, Bagpipe
 Droune, Charente, Contras
 Drouite, Dodo
 Drover's dog, Shepherd's Dog
 Druggists, Chemists and Druggists
 Drun (mts.), Waterford
 Drunaleague (l.), Craunogga
 Drunfish, Pogonias, Scianida
 Drummond's Isle, Gilbert Is.
 Drummoose Moor, Culloden
 Drupaceæ, Amygdalæ
 Druz, Dnieper
 Dryotomus, Woodpecker
 D. S. Repeat, Segno
 Deang, Tibet
 Dualistic system, Chemistry
 Dublitz (r.), Roesseny
 Du Buisson, Shale
 Dubuque, Iowa
 Duchray, Forth
 Duck (r.), Tennessee
 Duck Hawk, Harrier
 Ducos, Girondists
 Duddon (r.), Lancashire
 Dudwick Hill, Bachan
 Dufftown, Banffshire
 Dullins, C. Rome
 Duiveland, Zealand, Netherlands
 Duke Town, Calabar
 Dulciana, Organ
 Dulcite, Sugar
 Dumaresque, Darling
 Dumbowitz, Bucharest
 Dummodni, Dammudah
 Dum palm, Doom
 Dumtar, Dhumtoor
 Dun, Don
 Dun-Engus, Arran
 Dunaff Head, Swilly, Lock
 Dunamare, Queen's County
 Dun bird, Pochard
 Duncan, Rev. H., Savings-banks
 Dundaf Fall, Clyde
 Dundalk (r.), Louth
 Dundee, Viscount, Graham, John
 Dundiver, Gooseander
 Dufermilne, Lord, Abercromby
 Dungai, Ireland
 Hungaria, Chinese, Turkestan
 Dunkery Beacon, Exmoor Forest
 Dunmanus Bay, Cork
 Dunmyat, Clackmannanshire
 Dunnichen stone, Sculptured Stones
 Dunnideer, Vitrified Fort
 Dunkeilg, Vitrified Fort
 Dunvegan, Skye
 Duodecimo, Book
 Durant, Tammy
 Durante, Dante
 D'Urban, Natal
 Durgā, Saktas, Siva, Umā

- Durgāpāja, Umr
 Durham Book, British Museum
 Durtz, Durazzo
 D'Urville (c.), Papua
 Dutchman's pipe, Aristolochia
 Dutch mulce, Lathyrus
 Dutch white, Baryta
 Duty, Work
 Duty, Steam-engine
 Duyker-bok, Impoon
 Dvina, Duna
 Dwarf standards, Orchard
 Dwina, Duna
 Dyad elements, or dyads, Triads
 Dyaks, Bornea, Sarawak
 Dyala (r.), Tigris
 Dybbøl, Düppel
 Dycoteles, Peccary
 Dyer's buckwheat, Polygonæ
 Dyer's oak, Quercitron
 Dyer's rocket or weed, Weld
 Dykehead, Shotts
 Dynamical theory of heat, Thermo-
 dynamics
 Dynamometer, Spring Balance
 Dysart, Fifeshire
 Dysart Hills, Queen's County
 Dysoxylon, Alliaceous Plants.
 Dziggethal, Ass

 Eagle (l.), Falkland Islands
 Eagle wood, Aloces Wood
 Earache, Otalgia, Otitis
 Earleton, Berwickshire
 Early English, Anglo-Saxon Lang. &
 Lit.
 Earth almonds, Cyperus
 Earth-closet, Sewage Earth-closet
 Earth-nuts, Lathyrus
 Earthquakes, America
 Earthwork, Embankment
 Easdale, Hebrides
 East River, Long Isl. Sound
 Eastern Empire, Byzantine Empire
 Eastwaite Water, Lancashire
 East London, Kaffraria, British
 East-Lothian, Haddington
 Eau de luce, Venomous Bites and
 Stings
 Eau d'or, Lily of the Valley
 Ebal, Gerizim
 Elbelmen, Gems, Artificial
 Eblis, Adam, Genii
 Ebn, Ben
 Ebn Batuta, Africa
 Ebony, American, Wheelers
 Eboracum, York
 Eccaleobion, Incubation
 Ecclesiastical history, Church History
 Echatz (r.), Rentlingen
 Echeuldeæ, Remora

 Echidna, Typhon
 Echiuops, Tistle
 Eckenforde Florit, Slesvig
 Eckhart, Venusberg
 Eclogue, Pastoral Poetry
 Ecstasy, Neo-Platonists
 Edder, Hesse-Cassel
 Eden, Fifeshire
 Edgar, Scotland
 Edgar Town, Martha's Vineyard
 Edgeworthia Gardneri, Daphne
 Edible buck-eye, H.-chestnut
 Education, National Education
 Educationists, Voluntary, Voluntaryism
 Edwardes, Lieut., Sikh Wars
 Eclée, Kuldja
 Eflingham, Earl of, Reigate
 Effusion, Gases
 Egalité, Philippe, Orleans, Duc
 Egede Island, Spitzbergen
 Egerton, Francis, Ellesmere
 Egg-apple, Egg-plant
 Egiua, Egiua
 Egiua Marbles, Sculpture
 Eglinton tournament, Carrusel
 Egremont, Cumberland
 Egyptian bean, Nelumbo
 Egyptology, Archæology
 Ehretiacæ, Boraginæ
 Elfel, Prussia
 Eifelgebirge, Rhenish Prussia
 Elgg, Egg
 Elght Nights, Seven Wise Masters
 Ell (l.), Caledonian Canal
 Einbeck, Einbeck
 Elnhard, Eginhard
 Elusdorf, battle of, Seven Year's War
 Eld-houses, Earth-houses
 Elach (r.), Brenner Pass
 Eisk, Jelsk
 Elsieben, John, Agricola, J.
 Elsthal, Carpathian Mts.
 Ekron, Philistines
 Elaeopten, Oils
 Elam, Susa
 Elaterite, Bitumen
 Elaters, Hepaticæ
 Elath, Edom
 Elau (r.), Brecknockshire
 Elbe, Nassau
 El Bostani, Egypt
 El Buka'n, Cæle-Syria
 Elburz Mountains, Tehran
 El Dakkal, Oases
 Elder-flower water, Elder
 Elder rob, Elder
 Election, Parliament
 Elector's Hat, Gourd
 Electric eel, Gymnotus
 Electric egg, Induction of Electric Cur-
 rents

- Electric light, use of, Lighting of Beacons, &c.
 Electro-ballistic pendulum, Velocity, Initial
 Electro-biology, Animal Magnetism
 Electrode, Anode
 Electrolyte, Anode
 Eleme, Fig
 Elephant's foot, Dioscoreaceæ
 Eleuthera, Bahamas
 Elfin pipes, Tobacco-pipes
 El Gharbye, Nubia
 El Ghyr, Syria
 El Haje, Asp
 Elle rubies, Pyrope
 Elisenbad, Bohemia
 Elissa, Dido
 Elixir salutis, Senna
 Elizondo, Spain
 Elk, Wapiti
 El Kab, Eliethin, Necropolis
 El Kasr, Oases
 El Khuli, Hebron
 Ellichpore, Berar
 Ellis, A. J. Phonetic Writing
 Elodea Canadensis, Anacharis
 Elohistæ, Pentateuch
 Elorn, Finistère
 El Pao, Cumana
 Elphin, Rosecommon
 Elswick, Gun Factories
 Eltham Palace, Hall
 El Ufa, Algeria
 Elvas, Alemtejo
 Elvina, Coruña
 Elwick Bay, Shapinsay
 Elwy, Denbighshire
 Elytra, Coleoptera
 Elz (L.), Black Forest, Rhine
 Embarras (r.), Wabash
 Ember goose, Diver
 Embiotocidæ, Viviparous Fish
 Embossed Printing, Blind
 Embrued, Imbrued
 Embs (r.), Nassau
 Emerald, Type
 Emeraldine, Dye-stuffs
 Emerita Augusta, Spain
 Emen wren, Malurus
 Emgodesiye language, Agades
 Emir-ul-mumenu, Morocco
 Emmen, Bern
 Empirica, Medicine, Hist. of
 Emphyreal air, Oxygen
 Enaima, Zoology
 Encæula, Commemoration
 Encapsulation, Infusoria
 Eucanatic, Painting
 Enchanter's nightshade, Circea
 Encounter Bay, South Australia
 Encume mineral, Cappagh Brown
 Encumbered Estates Court, Incumbered Estates Court
 Encyating, Infusoria
 Enderby, Dampier Arch
 Enderby's Land, Antarctic Ocean
 Endopliceum, Bark
 Endopleura, Seed
 Endorsed, Indorsed
 Endosperm, Albumen
 Endrick (r.), Stirlingshire
 Euegy, Force
 Energy, conservation, transformation, &c., of, Thermodynamics
 Enfield rifle, Rifled Arms
 Enfis (r.), Aghmet
 Eufleurage, Perfumery
 Engelhardtia, Walnut
 English, Type
 English Harbor, Antigua
 English mercury, Chenopodium
 Engrossing, Ingrossing
 Engraulis, Anchovy
 Enhalow Sound, Pomona
 Enköping, Maelar, L.
 Enlistment, army, War Services
 Euna, Castro-Giovanni
 Ennistymon, Clare
 Ens, Transcendental
 Ense, Plantain
 Ensign, War Services
 Entails, register of, Records, Public, Registration of Deeds and Writs
 Entasis, Column
 Enteric Fever, Typhus, &c.
 Enthronement, Archbishop
 Entomyza, Blue-eye
 Entre Rios, Argentine Republic
 Entrochites, Beads, St. Cuthbert's
 Enz (r.), Black Forest, Neckar
 Enza, Po
 Enzie, Banffshire
 Epacto, Lepanto
 Epencephalon, Skull
 Eperva, Wallaba Tree
 Ephedra, Sea-grape.
 Ephelis, Macula
 Ephyre, Corinth
 Epidaurus, Ragusa
 Epigynous, Stamen
 Epilatories, Depilatories
 Epimachus, Plume-bird
 Epiphegus, Cancer-root
 Epiphæum, Bark
 Epiphyse, Ossification
 Episcopal Church, American, Anglo-Catholic Church
 Episperm, Seed
 Epistaxis, Nostrils, Dia. of
 Epistle, the, Lesson
 Equations, polar, Radius
 Equilibrium, Statics

- Equilibrium, stable, Stability
 Equites, Equestrian Order, Legion
 Equivalent number, Triads
 Equivocation, Reservation
 Eradicated, Erased
 Erasistratus, Medicine, Hist. of
 Erastianism, Erastus
 Erbia, Yttrium
 Erbil, Arbela
 Ericldoune, Earlston, Rhymer
 Escilla y Zúñiga, Alonso de, Spanish
 Lang. & Lit.
 Erdre (r.), Nantes.
 Erebus (mt.), Antarctic Ocean
 Eredia, Costa Rica
 Eresma (r.), Segovia
 Ergent (r.), Albania
 Ergloz (r.), Basel
 Eria, Silk and Silkworm
 Erich Edmondson, Sweden
 Eridanus, Po
 Erie Canal, Buffalo
 Erigul, Donegal
 Eriodendron, Razor-strop
 Erlsot, (l.), Lewis-with-Harris
 Eristalis, Rat-tail Maggot
 Erlenbach (r.), Zaberu
 Ernitz (r.), Bohemia
 Erme, Dartmoor
 Ernée (r.), Mayenne
 Erotemata, Lascaris
 Errocht, Erich
 Erromango, New Hebrides
 Erum, Taro
 Erythacn, Blue Bird, Redbreast
 Erythizon dorsatum, Urson
 Erythra Ionis
 Esaro, Cotrouo
 Escambia (r.), Florida
 Escondido, Nicaragua
 Escrow, Execution of Deed
 Escunge, Sontage
 Escuintla, Esquintla
 Estradon, Carmel
 Estrud, Azous
 Esedi, Persian Lang.
 Esk, Cumberland
 Eskdale Muir, Esk
 Eski-Hissur, Laodicea
 Esparan, Costa Rica
 Esparto, Murcia
 Espinosa, battle of, Victor
 Espirito Santo, New Hebrides
 Esquiline Hill, Rome
 Es Said, Egypt
 Esaura (r.), Aragon
 Esone (r.), Selue
 Estatica, Stigmatisation
 Estats (mt.), Ariège
 Esterlings, Sterling
 Esthwaite (l.), Windermere
 Estienne, Stephens
 Estrella, Costa Rica
 Eswan, Assouan
 Etocles, Antigone, Œdipus
 Etesian winds, Wind
 Ethbaal, Ptoemica
 Ethelred, England
 Ether, Quintessence
 Etherow (r.), Glossop
 Ethiopian pepper, Guinea Pepper
 Ethyl, sulphate of, Sulphuric Ether
 Ethylene, Alcohol
 Etruscan language, Etruria
 Etruscans, Rome
 Ettrick Pen, Dumfriesshire
 Etzel, Attila
 Eucalyu, Sugar
 Eudoxia, Alexel Petrowitch
 Endoxia, Rome
 Eulachon, Caudle-fish
 Eulopbia, Salep
 Eumenidæ, Wasp
 Euphodite, Trap
 Euphorion, Alexandrine Age
 Eupompus, Painting
 Euptea humata, Butterfly
 Eureka, Archimedes
 Euric, Spain
 Europa Point, Gibraltar
 European lotus, Date Plum
 Eurydice, Orpheus
 Euscaldunac, Basque Provinces
 Escaleria, Basque Provinces
 Eusara, Basque Provinces
 Eustrongylus, Strongylus
 Eustyle, Intercolumniation
 Eutychius, Arabian Lang. & Lit.
 Evans, Mr., Welsh Lang. & Lit.
 Eve or Even, Vigil
 Eventuality, Phrenology
 Everest (m.), Himalaya
 Evergreen oak, Ilex
 Ewe (r.), Marce (l.)
 Exalbuminous, Albumen
 Exchange, bill of, Bill of Exchange
 Exclusion of joints, Resection of Joints
 Excluded middle, Identity
 Excrementitious products, Secretion
 Equator, Consul, Mercantile
 Executur, Placetum Regium
 Exercise, Sanitary Science
 Exergue, Numismatics
 Exidium, Jew's Ear
 Exostosis, Ossification
 Extline, Vegetable Physiology
 Extrados, Arch
 Exuma, Bahamas
 Eyder, Denmark
 Eye (r.), Berwickshire
 Eyemouth, Berwickshire
 Eyeo, Katanga

- Eyes, Mining
 Eyessa, Falconry
 Eykhanians, Persia
 Eynort, Loch, Uist
 Eyre, Eire
 Eyub, Constantinople
 Eyun, Wahabis
 Ezlongeber, Edom, Red Sea
 Ezra, Pentateuch

 Faale, Albaurin el Grande
 Fabrizio, Fabricius, Girolamo
 Fachingen, Nassau
 Facial angle, Ethnology
 Faculty to burden, Appointment
 Fadhl A. R. Eidiu, Pers. Lang. & Lit.
 Fadievskoi, New Siberia
 Fagopyrum, Buckwheat
 Faham, Faam
 Fahlun, Falun
 Fairway, Diomed Islands
 Fairy pipes, Tobacco-pipes
 Fal (r.), Cornwall
 Falaise, treaty of, William the Lion
 Falashas, Abyssinia
 Falcon, J. Ch. Venezuela
 Fall (r.), Oregon
 False acacia, Locust Tree
 False calabash, Bottle-gourd
 False decretals, Isidorian Decretals
 Falsetto voice, Voice
 Famagosta, Cyprus
 Family of Love, Agapemone
 Fan, Blowing-machines
 Fanad Point, Swilly
 Fancy franchises, Reform
 Fane, Dundalk, Louth
 Fanners, Blowing-machines
 Faradisation, Tabes Dorsalis
 Farcy, Equinia
 Fardugale, Crinoline
 Fario, Salmon
 Faro, Benué
 Faro, Capo del, Sicily
 Farietan, Fars
 Fasa, Fesa
 Fasting-tide, Shrove-tide
 Fast-mass, Shrove-tide
 Fat glands, Skin
 Fauna, arctic, tropical, &c. Geographical Distribution of Animals.
 Faunus and Fauna, Roman Religion, Ancient
 Fansrecht, Golden Bull
 Faustus, Bishop of Riez, Semipelagianism
 Faverge, Valley of, Savoy
 Fawn, Fallow Deer
 Fayence, Valencia
 Feale (r.), Shannon
 Fear, Emotion

 Fearn, Farne Isles
 Featherfoll, Hottoula
 Feathering, Oar
 Fecht, Colmar
 Federalists, Republican, U. S.
 Federece, Würtemberg
 Feeders, Mining
 Feejee, Fiji Islands
 Feldberg, Black Forest
 Fellows, University
 Felsina, Bologna
 Feme Sole, Feme Coverts
 Fens, Middle Level
 Fen Town, Finsbury
 Feodor, Romanoff, House of
 Feral races, Wolf
 Fer de Moulin, Millrind
 Ferdinand III. of Castile, Spain
 Ferghal, Ireland
 Fergus, Scotland
 Fergus (r.), Shannon
 Ferid Eidiu Attar, Persian Lang. & Lit.
 Ferishtah, Persian Lang. & Lit.
 Ferment, Wine
 Fern Isles, Farne Isles
 Fernandez, Cuba
 Fernand Vas (r.), Ogobai
 Ferncy, Voltaire
 Ferolin Guianensis, Satin-wood
 Ferrari, Ludovico, Algebra
 Ferreo, Scipio, Algebra
 Ferruchi, Persian Lang. & Lit.
 Ferrum tartaratum, Tartaric Acid
 Fersala, Pharusus
 Fertile Isle, Christopher's, St.
 Fernu, Ammoniacum
 Fervenga (r.), Braganza
 Feugh, Dee
 Fever, relapsing, Relapsing Fever
 Fever, remittent, Remittent Fever
 Fever, rheumatic, Rheumatism
 Fever, scarlet, Scarlatina
 Fever-bush, Benzoin
 Feysul, Wahabis
 Fez, Morocco
 Fibre-plating, Goldlace
 Fibro-muscular tissue, Vascular Tissue
 Fibrous tumor, Womb, Diseases, &c.
 of
 Fibula, Foot
 Fichtegebirge, Main
 Fidaris, Ætolia
 Field-glass, Opera glass
 Field-rush, Luzula
 Fier (r.), Savoy
 Fife, Earls of, Stewart Family
 Fifer, War Services
 Fighine, Figline
 Fignes-caques, Date Plum
 Figure, Syllogism
 Filament, Stamen

- Filaria hominis bronchialis*, Strougy-
lus
Filaria piscium, Spiroptera
 Filature, Silk & Silkworm
 File, Label
 File-fish, Balistes
 Filisla marble, Phillippeville
 Filisla, Malta
 Fillets, Milt
 Filmore, Utah
 Flue, Repeat
 Flues and Recoveries, Flue of Land,
Records, Public
 Fin-fish, Rorqual
 Fingerling, Salmon
 Fingueria, Engraving
 Finlay (r.), Columbia, British
 Finnan haddocks, Haddock
 Finow Canal, Germany
 Finsterberg (mt.), Thuringerwald
 Fiorentino, Italy
 Fire-backed Pheasant, Macartney
Cock
 Fireballs, Aerolites
 Fire-draught, Warming & Ventilation
 Fire-flaire, Sting Itay
 Fireweed, Senecio
 Fire-worship, Sun & Fire Worship
 First-fruits (in law), Annates
 Firth of Lorn, Colousay
 Fish-culture, Pisciculture
 Fisherrow, Musselburgh
 Fishes, showers of, Showers of Fishes
 Fishguard Bay, Pembrokeshire
 Fishing eagle or hawk, Osprey
 Fish-ladders, Salmon
 Fish-maws, Mango Fish
 Fish-plate, Railways
 Fish salamander, Batrachia,
 Fish-skin disease, Ichthyosis
 Fish-stairs, Salween
 Fissiparous multiplication, Reproduc-
tion
 Fissure of the anus, Anus
 Fistula lachrymalis, Lachrymal Or-
gans
 Fitch, Polecat
 Fitch, Steam-navigation
 Fittri (l.), Sudan
 Fit-weed, Eryngo
 Fitz-alan, Stewart Family
 Fitzroy (r.), Queensland
 Fiumara, Flame
 Flumicino (r.), Rabicon
 Five-day fever, Relapsing Fever
 Five fingers, Star-fish
 Flaccus Albinus, Alcuin
 Flag, War Services
 Flagellum, Runner
 Flagstadde, Lofoden
 Flail, Thrashing
 Flamingo, Dionisio, Calvert
 Flan of Monasterboice, Irish Laug. &
Lit.
 Flanques, Flanches
 Flap operation, Amputation
 Flashed glass, Glass
 Fleabane, Conyza
 Fleawort, Plantaginæ
 Fleche, Fortification
 Fleetwood, War Services
 Flemingites, Sigillaria
 Flies, artificial, Angling
 Flinders (r.), Queensland, Australian
Explorations
 Flint (r.), Tennessee
 Flittermouse, Bat
 Flix-weed, Hedge-mustard
 Floating gardens, Floating Islands
 Floating mattress, Water-bed
 Floating sweet meadow grass, Manna
Grass
 Florac, Lozère
 Flores, Azores
 Florets, Flower
 Floripendio, Thorn-apple
 Fos Adonis, Adonis
 Floscularia, Rotatoria
 Flotation, Hydrostatics
 Flote fescue, Manna Grass
 Flower City, Springfield
 Flowering fern, Osmunda
 Flowering rush, Butomas
 Flowers of arsenic, Arsenious Acid
 Flowers of sulphur, Sulphur
 Flowk-wort, Hydrocotyle
 Fluke, Flounder
 Flush, Cribbage
 Flushing, Long Island
 Flutemonth, Fictularidæ
 Fly agaric, Amanita
 Fly-fishing, Angling
 Flying fox, Flying Lemur
 Flying opossum, Flying Phalanger
 Fœniculum Capense, Umbelliferæ
 Foggie, Humble Bee
 Fogo, Cape Verd Islands
 Foktshany, Suvorof
 Folio, Book
 Folkland, Saxony
 Follicle, Glands
 Follicle, Legume
 Folquet de Marseille, Tronhadour
 Fonka, Capo, Cos
 Fontaine, Algebra
 Fontainebleau, Renaissance
 Fontargente (mt.), Ariège
 Foo, Heen
 Foramen magnum, Spinal Cord
 Forbes, Lough, Shannon
 Forecastle, Fore
 Forefang, Forfang

- Forest Courts, Forest Laws
 Forest Ridge, Sussex
 Forest wool, Pine
 Form, Type
 Formartin, Aberdeenshire
 Formentera, Balearic Is.
 Formyle, Methylene
 Fort Dauphin, Bembatooka
 Fort du Quesne, U.S.
 Forteviot, Scotland
 Forth (r.), Tasmania
 Fort Hope, Columbia, British
 Fort Madison, Iowa
 Fort Montrie, Sumter, Fort
 Fortunate Islands, Phoenixia
 Fortune Bay, Newfoundland
 Fort Wayne, Indiana
 Fort William, Calcutta
 Fossil-Alkali, Sodium
 Fountains, House-leek
 Foul bill, Bill of Health
 Founmart, Polecat
 "Four Lands," the, Bergedorf
 Fous, House-leek
 Fousel-oil, Fusel
 Foveaux Strait, New Zealand
 Fovilla, Vegetable Physiology
 Foxing, Beer
 Fox-tailed monkey, Saki
 Foy, Fowey
 Foyers, Theatre
 Foyues, Limerick, Shannon
 Fraises, Fortification
 Frambœsia, Yaws
 France, education in, National Education
 Frankenbourg, Aix-la-Chapelle
 Frankenwald (mts.), Thüringerwald
 Franklin (mt.), White Mts.
 Franocheillean, Awe L.
 Fra Paolo, Sarpl
 Fraser's County, Invernesshire
 Frauds, statute of, Statute of Frauds
 Frederick August I. and II., Saxony
 Fredericksborg, Sweden
 Fredericksburg, Africa
 Fredericksburg, Virginia
 Fredericksoord, Drenthe, Pauper Colonies
 Frederick the Wise, Saxony
 Frederikshavn, Copenhagen
 Free livers, Perfectionists
 Free-soil Democrats, Republican
 Free-soil Party, U.S.
 Freestones, Peach
 Fregate (i.), Seychelles Is.
 Freiberg, battle of, Seven Years' War
 Fremont's Basin, Great Basin
 Fremont's Peak, Rocky Mts.
 French chalk, Steatite
 French pie, Woodpecker
 French rye-grass, Arrhenatherum
 French willow, Epilobium
 Freshford, Kilkenny
 Freshman, Cambridge University
 Fresh-water polyp, Hydra
 Fresh-water shrimp, Gammarus
 Freycinet's Peninsula, Tasmania
 Fribourg, Freiburg
 Friction-wheels, Friction
 Friedrichshall, Saxe-Meiningen
 Friedrichshamm, Peace of, Alexander I. of Russia
 Friedrichs-stadt, Leipzig
 Friedrich-Wilhelm's Canal, Germany, Spree
 Frigga, Freyja
 Fringilla spinus, Aberdevine
 Frio, Nicaragua Lake
 Frio, Cape, Rio de Janeiro
 Frit, Glass
 Frith, Reformation
 Fritigern, Valons
 Frog-fly, Froth-fly
 Frog-hopper, Froth-fly
 Frog-spittle, Froth-fly
 Froude, R. H., Tractarianism
 Fruit-sugar, Fructose
 Fuchsin, Dye-stuffs
 Fucus vesiculosus, Algae
 Fuenes, Count of, Rocroi
 Fuh, Honan
 Fu-klan, Fuh-keen
 Fulgentius, Semi-pelagianism
 Fulham, Convict
 Fullmart, Polecat
 Fulling, Woollen & Worsted Manufactures
 Fullness of Blood, Congestion of Blood
 Fulwa tree, Bassia
 Fumitory, common, Fumariaceae
 Funcha, Bogota
 Fung, Fum
 Fungliwa, Ningpo
 Fungic acid, Fungi
 Fungus Melitensis, Cynomorium
 Fungus salicis, Amadon
 Funiculus, Seed
 Funny bone, Brachial Artery
 Furnace, reverberatory, Reverberatory Furnace
 Furnarius, Oven-bird
 Furness, Lancashire
 Fur seal, Otary
 Fusible alloy, Bismuth
 Fusils, Lock
 Fusiyama, Japan
 Fustic, young, Sumach
 Futeh-Ali, Persia
 Futtocks, Ship-building
 Futwa, Futuha

Fyrd, Train-bands
Fyrd, Trinoda Necessitas
Fytte, Rhapsodists

Gabli, Rome
Gabres, Guebres
Gachna, Ophicephalus
Gadajos, Guadaluquivir
Gaddi, Taddeo, Painting
Gadenolite, Yttrium
Gades, Cadiz
Gadhelic, Gaelic Lang. & Lit.
Gaga, Kelskamma
Gagall, Podocarpus
Gagen, Star of Bethlehem
Galani butter, Bassia
Galatea, grotto of, Aci Reale
Galaxias, Salmonidae
Galegos, Lisbon
Galenists, Anabaptists
Galeus caulis, Tope
Galgacus, Agricola, C. J.
Galgocz, Freystadt
Gallacæe, Rubiaceæ
Galleaus, Jewish Sects
Galipot, Rosin
Gall, James, Sunday Schools
Gallanda, Gall, St. Caution of
Gallenstock, Valais
Galletyloe, Gallipot
Galley, Type
Gallia Belgica, Belgium.
Gallia Cisalpina, Cispadana, Trausalpina, Transpadana, Rome
Gallcanism, Gallican Church
Gallinago, Snipe
Gallinazo, Vulture
Gallinsecta, Coccus
Gallitzin, Galyzin
Galloway breed, Ox
Galloway, Earls of, Stewart Family
Gallus, Ireland
Gally-worms, Julius
Galofaro, Scylla & Charyb.
Galoshes, Goloshes
Galston, Ayrshire
Galtees (mts.), Tipperary
Galvauc pair, Galvaucism
Galvanometers, Galvanism
Gal-wihara, Ceylon
Gamant, Abyssinia
Gambeer, Gambir
Gambet, Sandpiper
Gambetta, Yellowlegs
Game-licences, Game
Gamgee, John, Veterinary Medicine
Gaming, Gambling
Gamle-by, Copenhagen
Gamrie, Banffshire
Gamtoos, Camtoos
Gauger Rolf, Harald I.

Gangrene of the mouth, Mouth
Gan-king-foo, Gan-hwny
Gausfort, Wessel
Gapau (r.), Var
Garagantua, Rabelais
Garay, B. de, Steam-engine, Steam-navigation
Garcia de la Huerta, Spanish Lang. and Lit.
Garcina, Cocum Oil
Garden Island, Baacho
Gardener's garters, Canary Grass
Garden warbler, Beccafico.
Gare (l.), Dumbartonshire
Garloch, Aberdeenshire
Garlic, crow, Allium
Garuet, pyramidal, Vesuvian
Garnock, Ayrshire
Garou bush, Daphne
Garreg, Flintshire
Garroque (r.), Sligo
Garry, Glen, Inverness-shire
Garry (r.), Tay
Gartan, Columba
Gartempo (r.), Vienne
Garum, Anchovy
Garvock, Kincardineshire
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Gatchonac, Kirkcudbrightshire
Gath, Philistines
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Gatto, Cape, Cyprus
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 Gelya, Cambay
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 Gensano, Genzano
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 German carp, Crucian
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 Hyposulphuric acid, Sulphur

Hyposulphurous acid, Sulphur
 Hypoxanthine, Urinary & Glands
 Hysterotomy, Cæsarean Operation
 Hywel Dda, Welsh Lang. & Lit.

Ialyria, Rhodes
 Iambia, Yambo
 Iambus, Iambic Verse
 Iapygiae Peninsula, Otranto
 Iapygians, Rome
 Iar Connaught, Galway
 Iberula, Hibernia
 Iberus, Ebro
 Ibi-Ganlu Pass, Himalaya
 Ibis, wood, Tantulus
 Iblis, Mohammedanism
 Ibn, Ben
 Ibn Batuta, Arabian Lang. & Lit.
 Ibn Mayman, Almeria
 Ibn Yahya, Arabraun Lang. & Lit.
 Ibo, Weebo
 Ice-knees, Whale
 Iceland spar, Calcareous Spar
 Ichnusa, Sardinia, Is. of
 Icon Amlac, Abyssinia
 Iconium, Konieh
 Iconium, sultanate of, Othman
 Iconouza, bridge of, Bogota
 Icos, Greece
 Icricock, Bericock
 Ictia, Wight, Isle of
 Ideality, Phrenology
 Ideographs, Hieroglyphics
 Ideology, Idea
 Idle (r.), Trent
 Idola tribus, specus, &c. Fallacy
 Idunsea, Edom
 Idzu, Cape, Simoda
 Ierne, Hiberula
 Iesi, Jesi
 Ignis sacer, Rose
 Iguarato elench, Fallacy
 Ihle, Burg
 Ihne, Oder
 Ij, Amsterdam
 Ijssel, Yssel
 Isle de la Camargue, Bouches-du-Rhone
 Ileo-cæcal valve, Digestion
 Ileria, Lerida
 Ilex, Paraguayanensis, Maté
 Ilil, Kuldja
 Ililac fossa, Alimentary Canal
 Ililac passion, Illeus
 Illiad, Homer
 Illissus, Attica
 Ilitz, Servia
 Ilkva, Odenberg
 Ill, Rhin, Bas
 Iller (r.), Alpes
 Illiger, Ornithology
 Illinois nut, Hickory

Ilm (r.), Saxe-Weimar-Eisenach
 Ilmeuu, Saxe-Weimar-Eisenach
 Iollo, Miagao
 "Il Pastore," Bandit
 Ilz, Bavaria
 Imago, Insects
 Imall, Wicklow
 Imbabura, Ibarra
 Imbricaria, Supotaces
 Inhampoor, Sofala
 Impari-pinnate, Leaves
 Impasto, Ground in Painting
 Imperial liquid, Cream of Tartar
 Imphee, Sugar-cane
 Imping, Falcoury
 Implacental, Mammalia
 Impoof, Eland
 Imposition of hands, Orders, Holy
 Inch Cape, Bell Rock
 Inchmarnock, Buteshire
 Incisors, Teeth
 Indal (r.), Sweden
 Indefatigable Isle, Galapagos Islands
 Indemulty, Bill of, Bill of Indemulty
 Inderab, Anderab
 Indian ass, Rhinoceros
 Indian Caucasus, Hindu Kush
 Indian cress, Tropæolum
 Indian hemp, Hashish, Hemp
 Indian jade, Nephrite
 Indian millet, Durra
 Indian oil tree, Bassia
 Indianola, Texas
 Indian ox, Zebu
 Indian physis, Gillenia
 Indian tobacco, Lobelia
 Indicator, Steam-engine
 Indicolite, Tourmaline
 Indicoeleustes, Cosmas
 Individuality, Phrenology
 Indragiri, Riouw
 Indrapura (r.), Samatra
 Induration, Softening and Induration
 Industrial exhibitions, Exhibitions
 Inebriates, establishments for, Dipso-
 mania
 Infantile remittent fever, Worm Fever
 Infected languages, Philology
 Infundibula, Respiration
 Ingathering, Feast of, Tabernacles, Feast
 of
 Ingleborough, Yorkshire
 Inglis (r.), Tasmania
 Ingulvia, Digestion
 Ingolf, Iceland
 Inguinal glands, Anal Glands
 Inhabiliteness, Phrenology
 Inhambane, Sofala
 Ink, marking, Silver
 Inkpen Beacon, Wiltshire
 Innakilly, Youghall

- Innerhoden, Appenzell
 Innishannon, Bandon
 Innisharkin (I.), Cork
 Innocent II., Pope, Roger II.
 Innuns, Innus
 Inoculation, Bidding
 Inosin, or Inosite, Sugar
 Inselberg (mt.), Thüringerwald
 Insomnia, Sleep
 Inspissated juice, Extracts
 Instar, Pregel
 Insurance, post-office, Insurance
 Insurance-broker, Ship-broker
 Intendant-general, Staff
 Interamna, Teramo
 Intercostal spaces, Ribs
 Interruption, Legates, Nuncio
 Intestinal fever, Typhus & Typhoid
 Fevers
 Intestinal juice, Digestion
 Intine, Vegetable Physiology
 Intrados, Arch
 Inverury, Aberdeenshire
 Invoice-book, Book-keeping
 Ionidium, Violaceæ
 Ios, Greece
 Ipek, Petah
 Ipe-tobacco, Bigoniaceæ
 Ipo, Upas
 Ipewich, Queensland
 Iriartes andicola, Wax-palm
 Iris (r.), Anatolia
 Irmenseule, Yggdrasil
 Iron, Age of, Bronze, Age of
 Iron Island, Tenasserim
 Iron, wine of, Tartaric Acid
 Iron-bark tree, Eucalyptus
 Iron-froth, Hematite
 Iron Gate, Servia
 Iron-refining, Bessemer's Process
 Iron-sand, Leadstone
 Ironsides, Cromwell's, Cromwell
 Ironstone, Black-band Ironstone
 Ironstone Mount, Tasmania
 Iron-wood, Date Plum
 Iron-wood, white, Xanthoxylum
 Irrationality of dispersion, Refraction
 Irritability of mæcles, Toxicity, Mus-
 cular
 Irun, Spain
 Isaac Angelus, Andronicus
 Isaac II., Byzantine Emp.
 Isaacs River, Queensland
 Isabella II., Spain
 Isabnormal lines, Isothermal Lines
 Isatis, Wood
 Ischys, Æsculapius
 Isel, Drave
 Iser, Flanders, West
 Iser, Bunzlau
 Iseline, Titanium
 Isgar, Celestis
 Ishak-ben-Suleiman, Arabian Lang. &
 Lit.
 Isla, Ostris
 Iskandere, Scutari
 Isker (r.), Turkey
 Islamabad, Cashmere
 Islampoor, Dacca
 Island of Desolation, Kerguelen's Land
 Islandshire, Shire
 Islebin, Agricola, John
 Isle of Bourbon Ten, Faam
 Isle of Serpents, Black Sea
 Isle Royal, Superior, Lake
 Isles, Lords of the
 Ismail, Persia
 Ismaili, Suez Canal
 Ismid, Nicomedia
 Isogonic lines, Terrestrial Magnetism
 Isolating languages, Philology
 Isouandra, Panchonti
 Isouza (r.), Austria
 Israeli, Mohammedanism
 Isak-kul (I.), Semipalatinsk
 Isoudun, Indre
 Isupant, Jecant
 Istacihuatl (mt.), Mexico
 Italian paste, Macaroni
 Italians, ancient, Rome
 Itapirica (I.), All Saints' Bay
 Itapicuru (r.), Bahia
 Itchen (r.), Southampton
 Ithon (r.), Radnorshire
 Iturbide, Emp. of Mexico
 Its (r.), Saxe-Coburg-Gotha
 Ivan Kalita, Russia
 Ivay, Parnua
 Ivel, Bedfordshire, Ouse
 Iverdun, (I.), Neuchâtel
 Ivernina, Hibernia-
 Ivisan, Capis
 Ivry, battle of, Henry IV. (France)
 Ixodes and Ixodidae, Tick
 Ismid, Nicomedia
 Jablonovy (mts.), Irkutsk
 Jacare, Alligator
 Jack, Pike
 Jack-tailah, Ootacamund
 Jack-by-the-hedge, Allaria
 Jackson, Pugilism
 Jackson, Tennessee
 Jacobean style of architecture, Roman-
 sance
 Jaffua peninsula, Ceylon
 Jagatai, Turkestan
 Jagers, Chasseurs
 Jahnvi (r.), Ganges
 Jaik (r.), Ural
 Jallum, Bijahar
 Jalon (r.), Calatayud

- Jalun, Bundesland
 Jamaica, Long Island
 Jamaicua, Audira
 James Isle, Galapagos Is.
 Jamestown, Barbadoes
 Jamuri, Albania
 Janiculus, Mons, and the Janiculum, Rome
 Jantra (r.), Tirnova
 Japan earth, Catechu
 Jarama (r.), Tagus
 Jarchi, Rashi
 Jardin des Plantes, Botanic Garden
 Jargouelle, Pear
 Jarool, Lagerstroemia
 Jaroslaw, Russia
 Jar-ra-warnaug, Baritah
 Jasmine fire, Pyrotechny
 Jasou (l.), Falkland Is.
 Jatropha nute, Physic-nut
 Jâta, Punjab, Sikhs
 Jauru, Paraguay, river
 Javalon, Guadiana
 Javorskij, Russian Lang. and Lit.
 Jaw-fall, Trismus Nascentium
 Jaxt, Neckar
 Jazygee, Transylvania
 Jean Paul, Richter
 Jebel Abad (mta.), Persia
 Jebel-el-Bied, Blanco, Cape
 Jebel-er-rahme, Ararat M.
 Jebel-esli-shehki, Lebanon, Anti-
 Jebel Haduar, Atlas Mts.
 Jebel Katharin, Sinai
 Jebel Mâsa, Sinai
 Jeddah, Jiddah
 Jefferson (mt.), White Mts.
 Jegani, Albania
 Jehovahists, Pontatench
 Jehroom, Fars
 Jejunum, Alimentary Canal
 Jeillinghee (r.), Bengal, Ganges
 Jelly-fish, Acalephæ
 Jemmingen, battle of, William, Prince of Orange
 Jemtland, Sweden
 Jentharzar, Norilzar
 Jennil, Granada, Spain
 Jenner, Dr. Typhas and Typhoid Fevers
 Jerea, Xeres
 Jer-falcon, Gyr-falcon
 Jericho's Ford, battle of, U. S.
 Jerusalem oak, Chenopodium
 Jesees, Falconry
 Jesuit's drops, Benzoin
 Jeteo, Asclepiadaceæ
 Jethou, Jersey
 Jews' apple, Egg-plant
 Jesebel, Ahab
 Jikadane
 Jiloca, Ebro
 Jinn, Genii
 Joannes Christiana, Zablism
 Joannes Eremita, Casselanus
 Joannina, Albania
 Jocaste, Oedipus
 Jogge, Jongs
 Johannes, emperor, Byzantine Empire
 John of Brienne, Byzantine Empire
 John of Bruges, Anabaptists
 Johnshaven, Kincardineshire
 Johnsoulana, Ana
 John the Almoner, Chrysostom
 John Tzimiskes, Byzantine Empire
 John XXIII, Pope, Schism, Western
 Jointed pipewort, Eriocaulaceæ
 Joints, resection or excision of, Resection of Joints
 Joints, stiffness in, Ankylosis
 Jokgru, Zaberu
 Joliffea, Africa
 Jonathan ben Uzziel, Targum
 Jones, Owen, Welsh Lang. & Lit.
 Jongleur, Troubadour
 Jonzac, Charente-Inferieure
 Jorat, Mont, Vaud
 Jordanes, Jornandes
 Jordshaul, Arabian Lang. & Lit.
 Josa, Tarifa
 Jotuns, Giants and Dwarfs
 Joubert, Glass
 Joutfroy, Marquis de, Steam-navigation
 Journal, Book-keeping
 Jovinus, Valentinianus
 Jowaree, Durra
 Juana, Cuba
 Juan Manual, Spanish Lang. & Lit.
 Juba, Muscat
 Jubal, or Jublah, Strait of, Red Sea
 Jubell, Byblos
 Jubianik, Bosnia
 Juca, Mauloc
 Judcock, Snipe
 Jug (r.), Vologda
 Jugga, Jongs
 Jugulars, Circulation
 Julian, Count, Roderic
 Juliana, Prunes
 Julian Period, Period
 Jullers, Jullch
 Jumarte, Hybrid
 Jumper, Blasting
 Jumping mouse, Deermouse
 Juncaginæ, Alismaceæ
 Juncus, Rush
 June-berry, Amelanchier
 Jungferasprung, (mt.), Saxony
 Juguann, Bohemia
 Jaulata (r.), Susquehanna

Junior optime, Wrangler
 Junjera, Cancan
 Jupiter, Planets
 Jurangou, Pyrenees, Bases
 Juraac, Oolite
 Jurat, Affidavit
 Jure devointo, Patronage
 Jurunt, Earth-nut
 Jurna (r.), Amazon
 Justicia, Acanthus
 Justin II. Byz. Empire
 Justinian II. Byz. Empire
 Jusuf-ben-Jakub, Alfonso I.
 Jutay (r.), Amazon
 Jutoe, Anglo-Saxons
 Juts, Sinds
 Jyhuu (r.), Zelthun

Kanb-ben-Zohair, Arabian Lang. & Lit.

Kabluda, Loango
 Kabiri, Phenicia
 Kabus, Persian Lang. & Lit.
 Kabyles, Berbers
 Kachugak, Lena
 Kadi-kane, Millet
 Kadiköi, Constantinople
 Kadjak Isles, Russia
 Kadoo, Java
 Kæmpferia pandurata, Turmeric
 Kafu, Nile
 Kahlamba (mts.), Zululand
 Kahoolani, Sandwich Is.
 Kald, Sheep-louse
 Kalfung-fu, Houan
 Kalla, Indus
 Kallara, Temple of, Elora
 Kalmakaua, Turkey
 Kaisarijeh, Anatolia
 Kaiserstuhl, Black Forest
 Kakaterra tree, Dacrydium
 Kakerlac, Cockroach
 Kakerlaken, Albinos
 Kaki, Date Plum
 Kalabagh (mts.), Salt Ranges
 Kalagwe (l.) Zambesi
 Kalambi (mt.), Kafiraria
 Kalambu, Colombo
 Kalamita, Bay of, Alma
 Kalany-ganga, Colombo
 Kaldera, Screw Pine
 Kall, Uml
 Kalihara Desert, Namaqualand
 Kali-mas (r.), Surabaya
 Kalimazoo, Michigau
 Kali Nuddi (r.), Kunuo
 Kalipani, Ghogra
 Kalonga (r.), Borodino
 Kamburg, Saxo-Meiningen.
 Kamehameha I., II., &c. Sandwich Islands

Kameia, Vermifuges
 Kamtchadales, Kamtchatka
 Kanarak, Cuttack
 Kandalak, Gulf of, White Sea
 Kandyana, Ceylon
 Kangaroo rat, Potoroo
 Kangaroo vine, Vitaceæ
 Kang-tung, China
 Kauowry, Bornu
 Kanpoo, Hang-Chow-Foo
 Kan-su, China
 Kapunda, South Australia
 Karadagh, Montenegro
 Karague, Albert N'yanza
 Kara Keriman, Babatag
 Kara-kool, Bokhara
 Karakorum (mts.), Tibet
 Kara-kum, Kizil-kum
 Karaach, Banat
 Kara See, Russia
 Karatchil, Sinds
 Karlsruhe, Carlsburg
 Karmoot, Siluridæ
 Karmör, Carn. Os
 Karoefa, Papua
 Karotcha, Korotcha
 Karuu (r.), Shuster
 Kasbec (mt.), Terek
 Kasbin, Persia
 Käsensburg, Schwarzburg
 Kasipoor, Kumaon
 Kaseu, Catechu
 Kastron, Antiparos
 Kataludin (mt.), White Mts.
 Katchi, Tibet
 Katherinenberge, Radom
 Katif, Wahabia
 Katchalluskala, Dubovka
 Katskill (mts.), New York state
 Kattegat, Cattegat
 Kattywar, Guzerat
 Katune, Ob
 Katunsk (mts.), Altai Mts.
 Kaul, Sandwich Islands
 Kava, Ava
 Kaye, Bishop, Sabbath
 Kayinga (l.), Victoria Lake
 Kayserling, Count, Russia
 Kazbeck (mt.), Tiflis
 Kazemba, Casembé
 Kazvin, Casbin
 Kea, Caug
 Keang-ee, China
 Keang-ew, China
 Kearsarge, the (ship), Alabama
 Kedah, Quedah
 Kedirie (r.), Serabaya
 Kedrou, Kidrou
 Keadah, Quedah
 Keeper (mt.), Tipperary
 Kee-wee-naw, Superior, Lake

Keffing, Moluccas
 Kefr Cana, Cana of Galilee
 Keg-fig, Date Plum
 Kelberg, Erzgebirge
 Keith, Banffshire
 Keltia, Rhinoceros
 Kelenonesia, Polynesia
 Keller, Engraving
 Kellet Straits, Melville I.
 Kelp ware, Wrack
 Kelt, Salmon
 Kemi, Egypt
 Kemi, Lapland
 Kempenfeldt, Admiral, Royal George
 Ken, Cane
 Ken (L.), Dee
 Kenia, Moon, Mountains of
 Kenmare Bay, Kerry
 Kennet (r.), Thames
 Kenneth, Scotland
 Kenosha, Wisconsin
 Kentucky coffee tree, Gymnocladus
 Kenwyn (r.), Truro
 Keppel, Falkland Islands
 Keppel Bay, Queensland
 Keptchak, Kiptchak
 Keratose, Sponge
 Kerka, Dalmatia
 Kerkhab, Persia
 Kernwald, Unterwalden
 Kerrera, Hebrides
 Kerry Head, Shannon
 Kershope Water, Border
 Kertch, Strait of, Yenikale Strait
 Keswick (L.), Derwentwater
 Ket, Ob
 Ketch, Jack, Executioner, Tyburn
 Ketly, Shropshire
 Key, Moluccas
 Keys, Calcos
 Keys, relative, Relative Keys
 Keystone, Arch
 Kezanlik, Kasanlik
 Khabe, Cabea
 Khafren, Egypt
 Kham, Tibet
 Khamsin, Egypt
 Khan, Caravansarai
 Khapain, Khafaloun
 Kharfah, Wahabis
 Kaseou-Kaye, Khaya
 Khât, Cutha
 Khaurazin, Khiva
 Khnum, Egypt
 Khoud, Tamil
 Khonds, India, Orissa
 Khopah, Trebizond
 Khoper (r.); Don, Penna
 Khor, Tibet
 Khora, Samos
 Khoten, Turkestan

Khndavenkiar, Anatolia
 Khur, Dziggethal
 Kia-ling (r.), Yang-tze-kiang
 Kiang, Dziggethal
 Kicheney, Kishennau
 Kidwelly, Caermarthenshire
 Kiery, Amaranth
 Kiesh, Cow Pursnip
 Killane (L.), America, Sandwich Is-
 lands
 Kilbirnie, Argyleshire
 Kilbrennan Sound, Arran
 Kildrum, Waterford
 Kileh-shergat, Assyria
 Killmane, Zambesi
 Killaloe, Clare
 Killington Peak, Appalachians
 Killybegs, Donegal
 Kilnichael Point, Wexford
 Kimair (r.), Troy
 Kimbri, Cimbri
 Kimmridge coal, Shale
 King, explorer, Australian Explorations
 Klugarth, Vitified Fort
 King-hiri, Tyrant Shrike
 King Charles's South Land, Tierra del
 Fuego
 King-duck, Elder
 King-ki tao, Corea
 King of the herrings, Shad
 King's hood, Humulantes
 King's Island, Bengal, Bay of
 King's Island, Limerick
 Kingiang, Ningpo
 King vulture, Condor
 King William's Town, Kaffraria, British
 Kiri Balu, Borneo
 Kino, Jamaica, Seaside Grape
 Kinspin, Corea
 Kintore, Aberdeenshire
 Kinzig (r.), Black Forest
 Kipper, Salmon
 Kippure (mt.), Dublin
 Kirensk, Irkutsk
 Kiriaghuna, Asclepiadaceæ
 Kirkdale Cavern, Caves
 Kirkton, Crediton
 Kirtynassa, Ganges
 Kishengunga, Mazafurabad
 Kishon, Carmel
 Kish-Tshal, Nucha
 Kisil (r.), Ural
 Kisil-Irmak (r.), Anatolia
 Kiaky Thomas nut, Hickory
 Kissavo, Ossa
 Kitchen middens, Recent Period
 Kitjap, Soy
 Kitta, Muggle
 Kittatinnies, Appalachians
 Kizil-Uzen, Azerbaijan
 Klar (r.), Wener Lake

Klaus Narr, Court-fool
 Klek (mt.), Dinaric Alps
 Klephte, Armatolos
 Kletigan, Schnflausen
 Klip (r.), Natal
 Klip-dasse, Damau
 Klinchi, Zlatoust
 Klutschewsk, Volcanoes
 Klodnitz, Oder
 Kloster-Erbacher, Rhine-wine
 Klintha, Otago
 Knees, broken, Broken Knees
 Knepl, Ainmon
 Knishulin, Russian Lang. & Lit.
 Knight-heads, Shipbulldlug
 Knock (mt.), Banffshire
 Knockmahon, Waterford
 Knockmeledown (mt.), Tipperary
 Knot of Cosco and Pasco, Peru
 Know-nothing party, U.S.
 Knox's Isle, Gilbert Islands
 Knysna Inlet, Cape of Good Hope
 Kobdo (r.), Altai Mts.
 Kocher (r.), Neckar
 Kochia, Belvedere
 Koepang, Timor
 Koeti, Borneo
 Kohik, Bokhara
 Ko-ko-nor, Tibet
 Kokum oil, Cocum oil
 Kolberg, Colberg
 Koleah, Algeria
 Kolerum, battle of, Tippoo Sahib
 Kules, India
 Kolguev, Kalguef
 Kolubara (r.), Servia
 Koluri, Salamis
 Komori, Comori
 Komotapur, Loll Bazaar
 Komul, Turkestan
 Komuldsinn, Ghumurdjina
 Konale (r.), Brahmaputra
 Konevelt, Ladoga
 Kongsberg, Silver
 Kongun, Congoon
 Königgratz, battle, Germany
 Königeborn, salt-works of, Unna
 Königsmark, Countess A. Saxe, Count
 of
 Königstein (mt.), Saxony
 Koolokamba, Gorilla
 Koombar, Gmellua
 Kooth, Putschuk
 Köppling, Maclaur, L.
 Köpril, Moh. Ot. Emp.
 Korie (r.), Ajmeer
 Korkilo, Cape, Cos
 Kormachiti, Cape, Cyprus
 Koro, Fiji Islands
 Koroua, Carlsstadt
 Körös (r.), Theiss

Kosala, Onde
 Kosciusko (mt.), N. S. Wales
 Kosel, Oder
 Kosl, Little (r.), Furness
 Kosila (r.), Alnora
 Kosmos, Chaos
 Koso, Cuso
 Kotelnol, New Siberia
 Kothén, Cöthen
 Kotorosl, Jaroslav
 Kotoura, Khoi
 Kottagberry, Ootacamund
 Kottbus, Cottbus
 Kotzebue's Sound, America, Russian
 Kowek, Ain-tah
 Kowno honey, Lime (Linden)
 Kowrie, Kauri
 Krafla, Iceland
 Krakov, Cracow
 Krakowska (r.), Jaworow
 Kral, Padishah
 Krame, Booth
 Kranen, Peter, Vondel
 Kranichfeld, Saxe-Meiningen
 Krasnoi-yar, Caspian Sea
 Kriegsbere, battle, Nisch
 Krotalon, Castanets
 Krückau, Elmsborn
 Kuang-nam, Quang-nam
 Kuban (r.), Caucasus
 Kudamba, Cadamba
 Kullenburg, Culenborg
 Kukolnik, Nestor, Russian Lang. &
 Lit.
 Kulpa (r.), Carniola
 Kulaglis, Barbary
 Kunnawur, Bussahir
 Kund, Tamul
 Kunduz, Anderab
 Kungara, Nubia
 Kurland, Courland
 Kurnalli, Ghogra
 Kurrumnall, Chittagong
 Kurahi, Bokhara
 Kurnnassa, Ganges
 Kush, Ethiopia
 Kussa, Abyssinia
 Kusip, Osmospos
 Kuti Lama, Borneo
 Kutahouk-Kaiwardji, Ottoman Empire
 Kuvau-Daria, Jaxartes
 Kuyp, Cuyb, Jacob Ger.
 Kvalo (L), Tromsø
 Kwang-se, China
 Kwau-lun, Kuen-lun
 Kwei-chow, China
 Kyabunca, Kiaboucca
 Kyanite, Cyanite
 Kyffhausen, Schwarzburg-Rudolstadt
 Ky Garlep (r.), Vaal (r.)
 Kyle, Ayreshire

- Kyleakin, Skye
 Kylo River, Skye
 Kyll, Moselle
 Kyrie, John, Ross, Man of
 Kythnos, Archipelago
 Laach, Rhenish Architecture
 La Belle Alliance, Waterloo
 La Boesse du Dromedaire, Mont Blanc
 Labrador Tea, Ledum
 Laburie, E. Compressed-air Bath
 Labyrinth, Ear
 Labyrinthibranchidæ, Anabaalidæ
 Lacedæmon, Sparta
 Le Chatre, Indre
 Lachlan (r.), N. S. Wales
 Laconia, Morea, Sparta
 Lactine, lactose, Sugar
 Lactometer, Galactometer
 Ladhia, Ghogra
 Ladies' traces, Canary Grass
 La Digue (i.), Seychelles Is.
 Ladislaus I. Hungary
 Lady's fingers, Kidney-vetch
 Lady's smock, Cress
 Laens, Sweden
 Laertes, Ulysses
 Lævo-racemic acid, Tartaric acid
 Lafayette (mt.), New Hampshire, White
 Mts.
 La Fourche (r.), Washita
 Lagan (r.), Austrim, Down
 Lagenaria, Bottle-gourd
 Lagidium, Chinchilla
 Lago di Salpi, Manfredonia
 Lagostomus, Chinchilla
 Lagotis, Chinchilla
 La Haye Sainte, Waterloo
 Lahn, Nassau
 La Hogue, battle, Tourville
 La Isoletta, Cartageua
 Lalsee (r.), Savoy
 Lakaan (mt.), Timor
 Lakahia, Pupua
 Lalo, Adanaboula
 Lamar, Bolivia
 La Marmolaia (mt.), Alps
 Laimbau, Barbary
 Lambay Isle, Dublin
 Lambel, Label (her.)
 Lambert's nut, Hazel
 Lambourn, Berkshire
 Lambrequin, Mantling
 Lamb's lettuce, Corn Salad
 Laminitis, Founder
 Lammer Law, Lammermoors
 Lamnidae, Shark
 Lamo, Muscat
 Lamolite (r.), Vermont
 Lampern, Lamprey
 Lampeter, Cardiganhire
 Lampeter Brethren, Agapemone
 Lancastrians, Edward IV.
 Lancet, Painting
 Landau, Coach
 Landan (i.), Aral
 Land-claims, Railways
 Landed Estates Court, Incumbered Es-
 tates
 Landsturm, Landwehr
 Lane-end, Loughton
 Langdale pike, Westmoreland
 Langdon Hill, Essex
 Langde, Lotoden
 Language, origin of, Philology
 Language, science of, Philology
 Langue d'ouï or d'oil, Languedoc
 Lansen, Meliaceæ
 Lantana, Verbenaceæ
 Lanuvium, Rome
 Lap, Spinning
 La Palisse, Allier
 Lapis ollaris, Potstone
 Lap-jointed, Clincher-built
 La Rabita, Abusol
 Larantooka, Solor Islands
 Larat (i.), Timor-laut
 Larghetto, Largo
 Largo Law, Fifeshire
 Lariat, Lasso
 Lark (r.), Cambridgeshire
 Larkine's lamp, Magnesium
 Larne, Antrim
 Laryngismus stridulus, Thymus Gland
 Laryngotomy, Tracheotomy
 Las Lagrimas, Mahaga
 La Soufriere, Gaudeloupe
 Lasech, Telescope
 Lasting, Tammy
 Latent heat, Heat
 Lath, Riding
 Lathe, Batten
 Lathum, Latini, Rome
 Latooka, Albert N'yanza
 La Tour-du-Pin, Isere
 Latreia, Image-worship
 La Trezza Bay, Catania
 La Trobe (r.), Victoria
 Latter-day Saints, Mormons
 Launch (r.), Colmar
 Lauder (r.), Berwickshire
 Lauderdale, Berwickshire
 Laufenberg, Rhine
 Launch, War Services
 Laune (r.), Kerry
 Launy (r.), Clogher
 Laura, Petrarca
 Laurel-cherry, Cherry-laurel
 Laurel Ridge (mts.), Virginia
 Laurencekirk, Kincardineshire
 Laurentum, Rome
 Laurium, Greece

- Lausitz, Lusatia
 Lauter (r.), Bavaria
 Lauterbrunnen, Bern
 Lautern, Kaiserslautern
 L'Antuiois, Saône-et-Loire
 La Villemarqué, Vicomte de
 Lavinium, Rome
 Lawnjang, Solor Islands
 Lawn, Bleaching
 Law of nature and nations, Puffendorf
 Lawrence, Kansas
 Lawrence, St. Montreal
 Lawsonia inermis, Alkanua
 Laxatives, Purgatives
 Lay, Batten
 Lay-abbot, Abbot
 Layton-cum-Warbreck, Blackpool
 Lazaretto Creek, Tybee
 Lazarists, Paul, Vincent de
 Lazariyeh, Bethany
 Lazarus (s.), Ladrone
 Lazi and Lazistau, Trebizond
 Lazy beds, Potato
 Lea, Essex
 Leach, Entomology
 Leach (r.), Thames
 Leader (r.) Berwickshire
 Lead-glance, Galena
 Leadhills, Lanarkshire
 Leaf (r.), Pascagoula
 Leaf-woods, Conifers
 League of Poor Conrad, Peasant War
 Leamby (r.), Zambesi
 Leaotong, Manchuria
 Learmount, Thomas, Rhymmer, Thomas
 the
 Leather substitute, Leather cloth
 Leavenworth, Kansas
 Le Bas, Engraving
 Le Blanc, Indre
 Leblanc, Soda
 Lec, Vanilla
 Lecanora, Archil
 Ecco, (l.), Como, Lake of
 Lech (r.), Danube
 L'Ecluse, Botany
 Lectoure, Armagnac
 Leda (r.), Leer
 Leddon, Berkshire
 Ledger, Book-keeping
 Ledyard, traveller, Africa
 Lee (r.), Tralee
 Leamby (r.) Africa
 Leeba (r.), Zambesi
 Left-handed marriage, Morganatic
 Marriage
 Leg, Vanilla
 Legacy, residuary, Residuary Legacy
 Legatee, universal, Universal Legatee
 Legend, Numismatics
 Legendre (l.), Dampier Archipelago
 Leger, John, Waldenses
 Legitimate and illegitimate, Parent
 and Child
 Legray, Photography
 Lehigh (r.), Pennsylvania
 Lehue, Sandwich Islands
 Leicester, Earls of, Steward of Eng-
 land, Lord High
 Leichhardt, Australian Explorations
 Leine (r.), Hanover
 Leicoma, British Gum
 Leire, Leicester
 Leister, Fishing
 Leitha Hills, Austria
 Leith Hill, Surrey
 Leith, Water of, Edinburghshire
 Lek, Holland, South, Rhine
 Le-king, Chinese Empire
 Lemberg (int.), Wurtemberg
 Lemgo, Lippe
 Lemna, Vertebrata
 Le Nain, Painting
 Lenux, Dumbartonshire
 Lennox, Earls and Dukes of, Stewart
 Family
 Lenten mandates, Pastoral Letter
 Lentigo, Macula
 Lentalua, Spartacus
 Leo I., IV., VI., V., VI. Byzantine
 Empire
 Leo Africanus, Africa
 Leon, Luiz de, Spanish Lang. & Lit.
 Leonde, Revue
 Leonine City, Rome
 Leonisti, Waldenses
 Leopoldina, Chiquichiqui
 Lepanto, Gulf of, Corinth, Gulf of
 Lepidolite, Mica
 Lepidostrobna, Sigillaria
 Leporidae, Hybrid
 Leptidæ and Leptus, Tick
 Leptis, Barbary
 Le Puy, Pny, Le
 Lerneau Marsh, Argolis
 Le Rocher d'Anrou, St. Malo
 Lescon, Navarre
 Les Salntes, Gudeloupe
 Lesse (r.), Namur
 Lesseps, M. de, Suez
 Lestocq, Elizabeth Petrovna
 L'Estrange, H. Sabbath
 Lestris, Skua
 Letter-book, Book-keeping
 Letterkenny, Donegal
 Lettran, Lectern
 Letters-patent, Letters
 Leuckart, Tapeworm, Trichina
 Leucosthopes, and leucopathy or leuco-
 sia, Albino
 Leucosia, Lefkosta

- Lenkemia, Lencocythemia
 Levant, Mediterranean Sea
 Levant, an. Anus
 Levellers, Whiteboy
 Leven (r.), Dumbartonshire
 Leven (r.), Lancashire
 Leveu (r.), Tasmania
 Leveson Gower, Ellesmere
 Levisticum, Umbelliferae
 Lewanda, Russian Lang. & Lit.
 Lewis, Dampier Archipelago
 Lewis (r.), Washington (territory)
 Lewis, Ch. Bookbinding
 Lewis's Fork, Snake River
 Lex Hortensia, Rome
 Lex Julia, Sumptuary Laws
 Ley, John, Sabbath
 Leyte, Philippine Islands
 Ley-Timor, Moluccas
 Lex, Herault
 L'hombre, Quadrille
 Lhoughor, Caermarthenshire
 Liakhoff Islands, Siberia
 Liaou, Neu-Chwang
 Libertines, Calvin
 Libra, Aa.
 Licata, Alicata
 Licentiate, Orders, Holy
 Lichen, Prickly Heat
 Lichen starch, Iceland Moss
 Liche-wache, Wake
 Lichtenberg, Rhenish Prussia
 Lichtenstein (trav.), Africa
 Licinian, Law, Agrarian Law
 Licking (r.), Kentucky
 Liddel (r.), Cheviot Hills
 Liebfrauenmilch, Worms, (town)
 Liebig's condenser, Retort
 Liebig's extract, Soup
 Liebig's soup for children, Soup
 Liedertafel, Vaudeville
 Lienz, Tyrol
 Life-line, Life-preservers
 Liffey, Kildare
 Ligament, Bivalve Shells
 Light, undulatory theory of, Undu-
 latory Theory of Light
 Lightning meal, Lycopodiaceae
 Lign aloes, Aloes Wood
 Lillenstein (mt.), Saxony
 Lily, Guernsey, Amaryllidaceae
 Lima (r.), Entre Douro e Minho
 Limassol, Cyprus
 Limbara (mt.), Sardinia I.
 Limber, Shipbuilding
 Limbs, artificial, Artificial Limbs
 Line-ball light, Drummond Light
 Limestone shales, lower, Carboniferous
 System
 Limmat (r.), Alps, Zürich
 Limne, Bythe
 Limoncel, France
 Limpopo (r.), Oori
 Linacre, Medicine, Hist. of
 Linaria, Toad-flax
 Lindisfarne, Holy Island
 Lines, fishing, Angling
 Ling, Heath
 Lingavats, Salvas
 Lingga (is.), Rionw
 Lingual bone, Tongue
 Lingua Romana rustica, Romanic Lan-
 guages
 Linguetta, Cape, Albania,
 Lulka, Golf
 Linnho (l.), Argyllshire
 Linth, Glarus
 Linton, Cambridgeshire
 Lion monkey, little, Tamarin
 Lipalula, Oori
 Liparis vulgaris, Sucking Fish
 Lippia, Aloysia
 Liquation, Tin
 Liquidation, Joint-stock Co.
 Lismore, Waterford
 Lismore, Dean of, his book, Gaelic
 Lang. & Lit.
 Lissum, Cable
 Lithang, Tibet
 Lithobias, Centipede
 Litho-fracteur, Nitro-glycerine
 Lithomancy, Divination
 "Little Go," Cambridge Univ.
 Little Snake (l.), Anguilla
 Littorina, Periwinkle
 Livas, Turkey
 Liver-rock, Quarry
 Liverworts, Hepaticae
 Ljungau, Sweden
 Ljusne (r.), Sweden
 Llandello-vawr, Caermarthenshire
 Llandello rocks, Silur. Rocks
 Llandovery, Caermarthenshire
 Llandovery rocks, Silur. Rocks
 Llanerch-y-medd, Anglesey
 Llangefni, Anglesey
 Llanrwst, Denbighshire
 Llobregat, Catalonia
 Loading, Tontine
 Loapula (r.), Zambesi
 Loblolly Bay, Gordonia
 Lobolobo, Violaceae
 Lobositz, battle of, Seven Years' War
 Lob-worm, Lug-worm
 Locality, Phenology
 Locarno, Ticino
 Lochaber, Inverness-shire
 Lochan-Eilean, Crannoges
 Lochar, Dumfriesshire
 Lochgilphead, Argyllshire
 Lochindorb, Crannoges
 Loch Lochy, Caled. Canal

Lochmaben, Dumfriesshire
 Loch Mulck, Balmoral
 Loch-na-gar, Aberdeenshire
 Loch-na-Keal, Mull
 Lochy (r.), Inverness-shire
 Lochy (r.), Tay
 Lockyer, Sun
 Locofoco, Republican
 Locomotive, Railways
 Locust (r.), Black Warrior
 Locusta, Lobster
 Locust-bean, Carob
 Loddou (r.), Thames
 Lodomeria, Galicia, Austrian
 Loewy, Snu
 Logan, Queensland
 Logan stones, Cornwall, Rocking
 Stones
 Logcock, Woodpecker
 Log-hut, Hut
 Logon (r.), Begharml
 Lohri, Roree
 Loing (r.), Seine
 Lokao, Indigo
 Loland, Laland
 Loma (mt.), Niger
 Lombardo-Venetian Kingdom, Venice
 Lomnitz, Carpathian Mts.
 Lomond (mts.), Fifeshire, Kilmor-
 shire
 London pride, Saxifrage
 London rocket, Hedge-mustard
 Long-beard, Bromeliaceæ
 Long Bird (l), Bermudas
 Long Forties, Buchan-Ness
 Long Hope, Hoy
 Long Island, Bahamas
 Longobardi, Lombards
 Long-sight, Sight, Defects of
 Longue (l.), Seychelles Is.
 Longueville, Duchesse de, Rambouillet
 Long-wall, Mining
 Louneker, Overysel
 Loon, Diver
 Loopers, Caterpillar
 Loop Head, Shannon
 Lope de Rueda, Spanish Lang. and
 Lit.
 Lopez, Paragnay
 Lopez, Cape, Guinea, Gulf of
 Lopez, Gen. Maximilian
 Lophiodon, Tapir
 Lophophanes, Tit
 Lophorina, Bird of Paradise
 Lorca, Murcia
 Lord Howe's Is., Society Is.
 Lord of Misrule, Revels, Master of the
 Lords of Erektion, Teinds
 Lord's Prayer, Pater-noster
 Loreley, Sirens
 Loreoco Marquez, Soñala

Loricata, Reptiles
 L'Orient, Morbihan
 Lorn, Argyleshire
 Loru, Lords of, Stewart Family
 Lorraine, Family of, Guise
 Los Pastos, Andes
 Los Pinos, Cuba
 Losee, Gers
 Los Serranos, Patagonia
 Losele, Elgishire
 Losva, Perma
 Lot (r.), Villeneuve d'Agen
 Lota, Burbot
 Lotharins I. Carolingians
 Loudon, Marshal, Seven Years' War
 Loudun, Vienne
 Loughrigg Fell, Westmoreland
 Louis II., V. Carolingians
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 Dynasty
 Louisburg, America
 Louisiade Archipelago, Papua
 Loup (r.), Alpes Maritimes
 Loup-garou, Were-wolf
 Louise, sheep, Sheep-losee
 Louven (r.), Norway
 Louvre, Paris
 Lovat (r.), Veltich-Louki
 Love-feasts, Agape
 Love-les-bleeding, Amaranth
 Low Church, England and Ireland,
 Church of
 Lowea, Rose
 Lowenberg, or Lowenkopf, Slesengo-
 birge
 Lowes, Loch of the, Yarrow
 Lowthers, Lanarkshire
 Lowtherston, Fermanagh
 Loxa, Ecuador
 Lozère (mt.), Cevennes
 Luabo (r.), Zambesi
 Lubber-line, Compass, Mariner's
 Luca, Lucca
 Luca Borgo, Algebra
 Luca della Robbia, Sculpture
 Luena, traveler, Africa
 Lucayos, Bahamas
 Luce, Pike
 Luce (r. and bay), Wigtown
 Lucken gowan, Globe-flower
 Lucky punch, Father-lasher
 Lucuma, Sapotaceæ
 Lucumo, Tarquinus
 Lucy, Sir T., Shakespeare
 Ludwig's Canal, Germany
 Luffa (r.), Africa
 Lugar, Ayrshire
 Lugdunum, Lyon
 Lugdunum Batavorum, Leyden
 Lugg (r.), Radnorshire
 Luga-quilla (mt.), Wicklow

- Lulea (r.), Sweden
 Lull, Opera
 Lumpfish, Lumpencker
 Lumps of delight, Ratel-I-coum
 Luna, Selene
 Luna, Gulf of, Spezia
 Luna cornea, Photography
 Lunda (r. and mt.), Sarawak
 Lundy's Lane, battle of, Scott, Winfield
 Luue, Lancashire
 Lunel, Muscatel
 Luni, Barzana
 Lunule, Bivalve Shells
 Lupata (mta.), Africa
 Lupuline, Hops
 Lure, Falconry
 Luschnitz, Moldau
 Luslad, Camoena
 Luso (r.), Rubicon
 Luss, Dumbartonshire
 Luta Nzige, Little, Albert N'yanza
 Lu-Tchu, Loo-Choo
 Luternberg, Seven years' War
 Lutetia, Paris
 Lutter, battle of, Thirty Years' War
 Lutterbach, Bielefeld
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 Luxemburg, Germany
 Luxor, Thebes
 Lynnee, Duc de, Richelieu
 Luzan, Ignacio de, Spanish Lang. & Lit.
 Lyciscus, Wolf
 Lycium, Box thorn
 Lycophron, Alexandrine Age
 Lycophron, Thessaly
 Lycopels, Bugloss
 Lycopus, Gypsy-wort
 Lydoch (l.), Rannoch
 Lyke-wake, Wake
 Lymphangitis, Wadd
 Lymphoc, Hythe
 Lyon (r.), Tay
 Lyonia, Sorrel Tree
 Lyre pheasant, Lyre bird
 Lyrie, Poggio
 Lysippus, Sculpture
 Lystra, Bin-Bir-Kifla
 Lythe, Pollack
 Lytton, Columbia, British
- Maanelvan Falls, Waterfall
 Mabinogion, Welsh Lang. & Lit.
 Mabola, Date Plum
 Macacus, Rhesus Monkey
 Macacus allenus, Wanderoo
 Macallister (r.), Victoria
 Macarthy's Island, Gambia
 Macauco, Lemur
 McClellan, General, Richmond
 Macdonald, Flora, Stuart, Ch. Ed.
 McDowell, General, U. S.
- Macduff, Banff
 Macduff's Cross, Sanctuary
 Macedonian wars, Rome
 Mac-Flecknoe, Shad
 M'Gregor, Robert, Rob Roy
 Machaon, Esculapius
 Machavauna, Delagoa Bay
 Mache, Corn Salad
 Machery, Alwur
 Machetes, Ruff
 Mackarel midge, Rockling
 Mackenzie (r.), Queensland
 Mackerel-gulder, Garfish
 M'Kinlay, explorer, Australian Explo-
 rations
 Maclear, Sir T., Triangulation
 M'Leay (r.), New South Wales
 MacMurrough, Wexford
 Maconnals, Saône-et-Loire
 Macot, Savoy
 Macouba, Martinique
 Macoya, Macaw-tree
 Macpherson, Major, Orissa
 Macquarie Harbor, Tasmania
 Macrocytis pyrifera, Algae
 Mada, Kama
 Madalena, Madeira River
 Madawasca, Ottawa River
 Maddalena (l.), Caprera
 Madder style, Calico printing
 Maderno, Carlo, Peter's, St.
 Madhuca-tree, Basella
 Madinna, Martinique
 Madison (mt.), White Mts.
 Madoc, America
 Madog of Powys, Prince, Welsh Lang.
 & Lit.
 Madre de Dios, Patagonia
 Madrepore glass, Glass
 Maenon, Agathodes
 Maëtral, Mistral
 Mafia, Zanzibar
 "Maga," Blackwood
 Magalhens, Magellan
 Magdala, Gennesaret, Sea of
 Magdashooa, Zanzibar
 Magelang, Java
 Maghrib, Morocco
 Magi, Perses
 Magister equitum, Rome
 Magnusian limestone, Dolomite, Per-
 mian
 Magnusian water, Aërated Waters
 Magnetic equator, meridians, and poles,
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 Magnetism, Animal, Animal Magnet-
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 Magnetism of rotation, Rotation, Mag-
 netism of
 Magog, Gog & Magog
 Magoula glabrata, Tingi

- Magot, Barbary Ape
 Magney, Agave
 Mahalca, Guiana, Brit.
 Mahatcony, Guiana, Brit.
 Mahaleb, Cherry
 Mahameru (mt.), Java
 Maha Sarboji, Schwarz
 Maha-Singh, Runjeet-Singh
 Mahawelli-ganga, Ceylon
 Mahe, Pondicherry
 Mahe (I.), Seychelles Islands
 Mahabourg, Mauritius
 Mahee, Galls
 Mahi (r.), Balasinore
 Mahinoudieh, canal of, Alexandria
 Mahmud L. II. Ot. Emp.
 Mahou Bay, Nova Scotia
 Mahowa-tree, Bussia
 Mahren, Moravia
 Mahasiti, Society Islands
 Maidan, Calcutta
 Maiden of Norway, Alexander III. of Scotland
 Maiden Rocks, Antrim
 Maiden Stone, Sculptured Stones
 Maigne (r.), Shannon
 Main (r.), Antrim
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 Mainlaud, Pomona
 Mainland, Shetland
 Maio, Cape Verd Islands
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 Maltai (r.), Nelson
 Maltia, Society Islands
 Maitland Club, Rox. Club
 Maize beer, Chica
 Majak (r.), Borneo
 Majesty of bismuth, Bismuth
 Majoon, Hashish
 Majunga, Bembatooka
 Makarius, Russ. Lang. & Lit.
 Maki, Lemur
 Ma-kiang, Cochín-China
 Makololo tribe, Zambesi
 Makta, battle of, Algeria
 Malabar rat, Bandicoot
 Malacca caues, Rittan
 Malachite green, Bico
 Maladetta, Pyrenees
 Malahite, Pyrenees
 Malakhoff, Duc de, Pottier
 Malaskerd, battle of, Alp-Arsian
 Malatia, Kurdistan
 Malayalam or Malayarma, Tamil
 Malbrook, Cerocebus
 Malcolmia, Stock
 Malegnano, Melegnano
 Malekites, Sunnites
 Mali, Maldives Islands
 Mallard, Duck
 Mallemba, Cacongo
 Malleus Maleficarum, Witchcraft
 Mallicollo, New Hebrides
 Maloewa, Ombay
 Malpighian corpuscles, Spleen
 Malta, Phœnicia
 Maltese-point, Lace
 Maltese work, Filigree
 Malucha, Numidia
 Maluti, Orange R. F. State
 Malvern Hills, Worcestershire
 Mambai, Bombay
 Mamboue, Sofala
 Mammothiferous crag, Norwich Crag
 Mammary tumor, Adenocoele
 Mammoth trees of Calaveras, Wellingtonia
 Mammurk (mt.), Galway
 Mamore, Madeira River
 Manacles, Torture
 Manama, Bahrein Islands
 Mana Pass, Bhadrinath
 Manbote, Werigild
 Manchester School, Gibson
 Mauchius, Tungus
 Maucos Capac, Peru
 Mandarin duck, Summer Duck
 Maudi, Kumon
 Mandibles, Bill
 Mandioc, Manioc
 Mandrites, Abbot
 Manetobah (I.), Red River Settlement
 Mangabeys, Cerocebus
 Mangela, Cook Islands
 Mango ginger, Curcuma
 Mangouste, Ichneumon
 Mangrove hen, Rall
 Mangusba (I.), Alagoas
 Man-hole, Boiler
 Manice, Delagoa Bay
 Manillas, Ring Money
 Manilla, Quadrille
 Manipie, Legion
 Manlich, Don
 Manitoba (I.), Winnipeg
 Manjera, Beeder
 Mannheim gold, Alloy
 Manning (r.), New South Wales
 Mansourah, battle of, Egypt
 Mansuetæ naturæ, Fæm Animals
 Mantaro (r.), Ucayali
 Mantis crab or shrimp, Squill
 Man-traps, Trespass
 Mantras, Veda
 Manuel, emperors, Byzantine Empire
 Manuherikla, Otago
 Mannkan, New Zealand
 Man-wyrth, Werigild
 Maue, Inocarpus
 Mapoota (r.), Zululand
 Mar, Aberdeenshire
 Marabhauga, Ganges

- Maracanda, Samarkand
 Maragatos, Leon
 Maraja Palm, Bactris
 Marakah, Dongola
 Marakina, Tamarin
 Marangaba, Guava
 Maranoa, Darling
 Maranon, Amazon
 Marash, Kurdistan
 Maravi, Nyassa
 Mara wood, Icica
 Marazques, Liqueur
 Marburg, battle of, Seven Years' War
 Marcasite, Pyrites
 March, Morava River
 March, Earls of, Stewart Family
 Marchan (r.), Alabama
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 Mare Kryntheum, Arabian Sea
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 Maret, Garonne
 Margaret Mautasche, Tyrol
 Margarita, Antilles
 Margeride (mts.), Lozere
 Margosa tree, Meliaceae
 Marl, Niger
 Maria (i.), Tasmania
 Mariakirch, St Marie
 Mariampol, Mariapol
 Mariana (ia.), Ladrones
 Marauze (i.), Seychelles Is.
 Maricnana, Bahamas
 Mariefried, Muelar, Lake
 Marienthal, battle of, Turenne
 Marignano, Melegnano
 Marigot, Marie Galante
 Marimoude, Atoles
 Marion, Alabama
 Mariqua, Oori
 Maria, Sumatra
 Markaska, Macaresca
 Mark-duren, Duren
 Markelo, Overysel
 Marken, Zaider Zee
 Markgrafenbahu, Grosseuhahn
 Marking-ink, Silver
 Markobrunner, Rhine-wine
 Marlborough dog, Blenheim Dog
 Marl-grass, Clover
 Maristone, Lias, Oolite
 Marmotta, Olto di, Rhododendron
 Marony (r.), Guinea, French
 Maros (r.), Theiss
 Maros Porto, Carlsburg
 Marquette, Superior, Lake
 Marrah, Darfur
 Marron d'Eau, Trapa
 Marsaglia, battle of, Victor-Amadeus
 Marsdlep, Heider
 Marshall, Michigan
 Marshall, Texas
 Marsh barrier, Buzzard
 Marsh hen, Rail
 Marshland, Middle Level
 Marsh pennywort, Hydrocotyle
 Marsh rosemary, Statice
 Marsh trefoil, Buckbean
 Marsupium, Eye
 Marta and Mariaua, Bolsena
 Martinach, Martigny
 Martin Garcia, Buenos Ayres
 Marn (i.), Timor-laut
 Marua, Society Islands
 Marvejois, Lozere
 Marwar, Rujpoots
 Mary (r.), Queensland
 Maryborough, Queen's County
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 Mary's grass, Iceland Moss
 Masaccio, Painting
 Masagran, Algeria
 Masbate, Philippine Islands
 Masham, Mrs. Anne, Queen
 Mask (i.), Corrib L., Galway
 Maskat, Muscat
 Masora, Massorah, Jews
 Masoretic text, Bible
 Masoua, Massawah
 Masangane, Bay of, Sofala
 Massilia, Marseille
 Massilians, Semi-Pelagianism
 Massinisa, Carthage
 Master of the Revels, Revels, Master of the
 Master-slugs, Minnesingers
 Masudi, Arabian Lang. & Lit.
 Matadores, Quadrille
 Mataram, Lombok
 Mataara, Otago
 Mate, Merchant Shipping Act
 Materials, strength of, Strength of Materials
 Mat-grass, Nardus
 Mathematical physicians, Medicine, Hist. of
 Matrix, Type
 Matrix Composer, Printing
 Matrona (r.), Marie River
 Matronalia, Juno
 Matlawa, Ottawa River
 Mutterhorn, Cervin
 Matthiesen, John, Anabaptists
 Matthiola, Stock
 Mattock (r.), Boyne
 Matuka, Sofala
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 Maud, Empress, Stephen of England
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- Maule (r.), Ohlff
 Maulson, Pyrénées, Basses
 Manna, Navigators' Islands
 Mauna, Sandwich Islands
 Maunch, Manch
 Mauraneria, Styx
 Maurolycus, Optics
 Maving, Glass
 Mavrocardato, Mauracordato
 Mawdsach (r.), Merioneth
 Maw-worm, Ascaris
 Maxillary arch, Skeleton
 Maximilliana, Iunja Palma
 Maximin, Alexander Severus
 Maximus Planudes, Anthology
 May, Hawthorn
 Maya, Moluccas
 May-apple, Podophyllum
 Mayaguez, Puerto Rico
 May-drink, Commaru, Woodruff
 Mayer, Anatomy
 Mayhem, Beating & Wounding
 Mayo (r.), Sonora
 Mayonnaise, Remoulade
 Mays del Monte, Rhizanthes
 Mayweed, Feverfew
 Mban, Fiji Islands
 Meade, General, U. S.
 Meadow lark, Starling
 Meadow sweet, Spiræa
 Meal, mountain, Animalcule
 Meander, Carta
 Meandrina, Brainstone Coral
 Measures, Weights & Measures
 Measures, French, Chemistry
 Meat, preserved, Preserves
 Meat-biscuit, Biscuit, Meat
 Mentus, external, Ear
 Mediasch, Transylvania
 Medical officer of health, Sanitary Sc.
 Medina (r.), Wight, Isle of
 Medinat Habu, Ramesses, Thebes
 Mediolanum, Milan, Salutes
 Medlock, Oldham
 Medusa, Porseus
 Medusa's head, Pentacrinus
 Medveditsa (r.), Don (Russia)
 Meenas, Brindl
 Megakles, Pelistratos
 Megala Kastrou, Candia
 Megalopolis, Arcadia
 Megapode, Jungle Fowl
 Megaptera, Whale
 Meghna (r.), Brahmaputra
 Mehadpore, Indore
 Melkie, Andrew, Thrashing
 Mel-kwan, Chinese Emp.
 Melisav, Lithuania
 Mejdah (r.), Tunis
 Meknasa, Meknas
 Melancholic diathesis, Scrofale
 Melanesia, Polynesia
 Melanine, Cuttle-fish
 Melassic acid, Glucose
 Meleagridæ, Turkey
 Meleguetia pepper, Grains of Paradise
 Melek Shah, Seljuks
 Meletta, Herring
 Melluda, Muscat
 Melluo, Lesbos
 Melita, Malta
 Melitophil, Scarabacidae
 Mellitose, Sugar
 Melkart, Bagl
 Melkhout, Sideroxyloa
 Mellarosa, Bergamot
 Melle, Sevras, Deux
 Mellite, Honey-atome
 Mellivora, Ratel
 Melloca, Portulacæ
 Melon thistles, Cactæ
 Melophagus, Sheep-louse
 Meios, Greece
 Membrana nithana, Eye
 Membrana putaminis, Alantols
 Memmi, Simone, Painting
 Memorial, Brief
 Menaccante, Titautum
 Menangkabou, Sumatra
 Mencheres, Egypt
 Menclius, Meng-lee
 Mendaites, Zabism
 Mendawa (r.), Borneo
 Meudere (r.), Scamander
 Mene, Selenæ
 Menex (mts.), Côte-du-Nord
 Menfrici, Mend
 Menilek, Sabmas
 Menilite, Opal
 Meninges, Membrane
 Menkara, Pyramid
 Mennonites, Anabaptists
 Menomonee (r.), Wisconsin
 Menselinsk, Orenburg
 Monstrum, Solution
 Menteith, Perthshire
 Menteith, Earls of, Stewart Family
 Mentone, Monaco
 Mentu, Egypt
 Menyanthes, Buckbean
 Mephitis, Skunk
 Mercantile Marine Fund, Merchant Ship. Act.
 Mercury, Planets
 Mercury Bay, New Zealand
 Mer de Glace, Chamouni
 Mer de Sargasse, Alga
 Mur Douce, Huron
 Mergellus, Smew
 Mergular, Roiche
 Merluh, Orissa
 Merleuphi, Egypt

- Merim (l.), Rio Grande do Sul
 Merlangus, Whiting
 Merle, Blackbird
 Merlucius, Hake
 Mermaids' purses, Shark
 Mern, Murgab
 Merops, Pielades
 Meropie, Cos
 Merops, Bee-eater
 Merse, Berwickshire
 Mersey (r.), Tasmania
 Mertola, Alentejo
 Merv, Murgab
 Mervode (r.), Maas, Rhine
 Merwan, Omaniades
 Mesas, Venezuela
 Mesencepalon, Skull
 Mesophilum, Bark
 Mesothorax, Insects
 Messala, Tibullus
 Messaliana, Quietista
 Messiah, Sabbathais Zwi
 Messina, Ant. da, Painting
 Mesurata, Tripoli
 Meta (r.), Boyaca, Orinoco
 Meta, Circus
 Metacarpal bones, Hand
 Metal casting, Founding
 Metals, cohesion of, Alloy
 Metal-spinning, Britannia Metal
 Metapontum, Basilento
 Metastannic acid, Tin
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 Metan (r.), Bohemia
 Meteorites, Aërolites
 Meter, Gas
 Methodics, Medicine, Hist. of
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 Methven, Lords, Stewart Family
 Metidja, Plain of, Algeria
 Metrosideros buxifolia, Akee
 Menes lizard, Mosasaurus
 Mewar, Rajpoots
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 Millefiori glass, Glass
 Millenary Petition, Hampton Court Conference
 Miller, Steam-navigation
 Miller, J., Reporting, Parliamentary
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- Mountain laurel, *Oreodaphne*
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- Naab, Bavaria
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 Onatas, Sculpture
 Onchus, Fishes
 Ondatra, Musquash
 Oneiromancy, Divination
 Oneyzah, Wahabis
 Onion (r.), Vermont
 Onkaparinga (r.), South Australia
 Ononis, Rest-harrow
 Onopordon, Thistle
 Onos agrios, Unicorn
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 Oolowtee, Cambay
 Oori (r.), Transvaal Republic
 Oosterschelling, Terschelling
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 Ophiology, Zoology
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 Ophir (mt.), Malacca
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 Oppa (r.), Oder, Troppau
 Opposition (in astronomy), Conjunction
 Optical ghosts, Ghosts, Optical
 Optic thalamus, Brain, Cerebrum
 Oral Law, Talmud
 Orange, Roundle
 Orange root, Hydrastis
 Orarium, Stole
 Orb (r.), Herault
 Orbe (r.), Neuchâtel
 Orbitolites, Rhizopoda
 Oracles, Orkneys
 Orcagna, A. Painting
 Orchard grass, Cock's Foot Grass
 Orchida, Orchideæ
 Orchy, Awe (l.)
 Orco Falls, Waterfall
 Orcus, Roman Religion, Ancient
 Order-book, Book-keeping
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 Orellana, Amazon
 Orenburg gum, Larch
 Orestes, Agamemnon
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 Organ, Pneumology
 Organography or organology, Botany
 Organzine, Silk & Silk-worm
 Oriental jade, Nephrite
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 Original Burgher Presbytery, U. P.
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 Orizava, (mt.), Mexico
 Orkhan, Ottoman Empire
 Orkney (derivation of name), Hebrides
 Orkney, Earls of, Hamilton Fam., Sin-
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 Orla (r.), Saxe-Weimar-Meissen
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- Orsajo (mt.), Parma
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 Osmia (r.), Turkey
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 Osmerus, Smelt
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 Ostheim, Saxo-Weimar-Eisenach
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 Othman I., II., III., Ottoman Empire
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 Ottocar, Rudolf
 Ottochar, Odoacer
 Ouchy, Lausanne
 Ouder Amstel, Nieuwer Amstel
 Ondon (r.), Mayenne
 Onosant, Ushant
 Onette, Mayenne
 Oughter (l.), Cavan
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 Ovarian tumor, Ovaries
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 Overduckee, Holland, South
 Overshot wheel, Water-power
 Ovis, Sheep
 Ovoca, Avoca
 Ovalan, Fiji Islands
 Ovum angulatum, Viper
 Owenmore (r.), Sligo
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 Owl parrot, Kakapo
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 Oxen-le-Field, Darlington
 Ox-eye bean, Cowage
 Oxford tract, Tractarianism
 Oxidising flame, Blow-pipe
 Ox Mountains, Sligo
 Oxyculoride of carbon, Phosgene Gas
 Oxyasalts, Salts
 Oyapock, Guiana, French
 Oyster Bay, Tasmania
 Oyster plant, Salsafy
 Ozan, Chizerote
 Ozokerite, Wax
 Pabbay, Skye
 Pacasse, Pegasse
 Pachacamac, Peru
 Pacheco, Donna Maria de, Padilla,
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 Pachyrizos, Root
 Packenham, Gen. U. S.
 Paco, Alpaca
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 Paganus, H. de. Templars
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 Pago-Pago, Tutuila
 Pailon (r.), Alpes Maritimes
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 Paint Rock (r.), Tennessee
 Paknam, Siam
 Palais, Bellesse-en-Mer
 Palamedea, Screamer
 Palauia (r.), Segorbe
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 Palazzolo Acreide
 Pallkat, Pulcat
 Palitach (l.) Theresloped
 Palki, Palanquin
 Pallet (in heraldry), Pale
 Palmas, Cape, Guinea, Galt of
 Palm cabbage, Cocoa-nut
 Palm-honey, Coquito
 Palmistry, Chelromancy
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 Pannunkey (r.), York
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Panaria, Lipari
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 Panic, Pan
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 Panphobia, Fear
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 Parameters, Variation of
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 Parang Pass, Himalaya
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 Parthenay, Sèvres, Denx
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Parts of Holland, Kesteven, Lindsay,
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 Parus, Tit
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 Pashinba, Irtarte
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 Pasoeroewau, Java
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 Passamaquoddy (r.) Croix, St
 Passaro, Capo, Sicily
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 Patani, Siam, Gulf of
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 Pater, Pembroke
 Pati, Java
 Patience, garden, or dock, Spinach
 Patience Gulf, Sakhalin
 Patino, Patmos
 Patta, Muscat
 Pattan, Puttan
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 Paulenzelle, Schwarzburg-Rudolstadt
 Paume, Tennis
 Paumotu (I.), Low Archipelago
 Paunch, Rumbautia
 Paupers, removal of, Removal of
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 Pawn, Betel
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 Pawtuxet (r.), Rhode Island
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 Peace (r.), Columbia, Brit.
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 Peacock, Algebra
 Peacock moth, Emperor Moth
 Peak, the, Derbyshire
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 Peake, Life-bout
 Pearl, Type
 Pearl (r.), Canton
 Pearl opal, Cacholong
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 Pease, Edward, Railways
 Pebble (I.), Falkland Is.
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- Pecten, Eye
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 Peculium, Serf, Slavery
 Pedal, Organ
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 Peloria, Toad-flax
 Peloric (mts.), Sicily
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 Peña-de-Penaranda (mt.), Asturias
 Pend's Forest and Hill, Clitheroe
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 Pennant, Pendant
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 Penny Dog, Topo
 Penny-of-gold, Rose-noble
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 Pentateuch, Samaritan, Samaritan Pentateuch
 Pentathionic acid, Sulphur
 Pentheslea, Attica
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 Pepin, Lake, Wisconsin
 Pepper-brand, Blight Brand
 Pepper-corn, Ear-cockles
 Pepperwort, Cress
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 Perch, linear, Rod
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 Peridium, Puff-ball
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 Phacochærus, Wart-hog
 Phanogamons, Phanerogamons
 Phaeton, Coach
 Phalangas, Hand, Foot
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 Philoprogenitiveness, Phrenology
 Philosopher's stone, Alchemy
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 Phlegmatic diathesis, Scrofula
 Phoca, Seal
 Phoenician Lang. and Lit. Phœnicia
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 Phonantograph, Music Recorder
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 Phonolite, Olinketone, Trap
 Phornium, Flax, New Zealand
 Phosphorite, Apatite, Phosphorus
 Photo-galvanography, Photography
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 Photo-micrography, Photography
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 graving
 Phyllocladia, Yew
 Phyllophagi, Scarabæides
 Phyllostoma, Spectre Bat, Vampire
 Physalus, Rorqual
 Physomyces, Fungi
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 Phytogeography, Botany
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 Pic d'Anle, Pyrenees
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 Pichne-writing, Writing
 Pickerel, Pike
 Pico Ruivo (mt.), Madeira
 Picric acid, Carbazotic Acid, Dye-
 stuffs
 Picton Island, Tierra del Fuego
 Picture-cleaning, Painting
 Pictured Rocks, Superior, L.
 Piculet, Woodpecker
 Piddock, Pholas
 Pic, French or Wood, Woodpecker
 Pietermaritzburg, Natal
 Pietra Nero, Malta
 Pigeon (r.), Superior, L.
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 Pigmy ape, Barbary Ape
 Pigueroi, Pinnerolo
 Pig-nut, Earth-nut
 Pig-rat, Bandicoot
 Pigs' faces, Mesembryaceæ
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 Pika, Lagomys
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 "Pimple" copper, Electrometallurgy
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 Pinana, Custard Apple
 Pinang, Betel
 Pinang palm, Areca
 Pinars, Lycia
 Pinaric acid, Rosin
 Pincers, Torture
 Pinchbeck, Alloy
 Pincia, Valladolid
 Pincian Hill, Rome
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 Piper, Cidaris
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 Pipe Roll, - Records, Public

Pipes, flow of water in, Hydrodynamics

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Piphles, Cathart

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Piramidig, Night-hawk

Piran Round, Theatre

Pirate Isle, Bobia

Piraticaba, Campinas

Pirn, Bobbins, Spinning

Pir Panjal Pass, Dumdum

Pisano, Andrea, Sculpture

Pishtaka, Fox River

Pisiform limestone, Pea-stone

Pismire, Ant

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Pistoja, Cino da, Italy

Piston, Pump

Pisuerga (r.), Valladolid

Pit, Theatre

Pita fibre or flax, Yucca

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Pito, Chica

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Pi-tai, Scirpus

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Pitteween, Lord, Stewart Family

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Pitt, the Elder, Chatham

Pitt Town, Hawkesbury

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Pixies, Fairies

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Placentia, Newfoundland

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Plains of Promise, Queensland

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Planing, Shipbuilding

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Plantain, water, Alismaceae

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Platon, Russian Lang. & Lit.

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Plauze Canal, Germany

Pleasant Mount, White Mts.

Plectrophanes, Snow Bunting

Pleisse, Elster

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Plessis les Tours, Tours

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Plettenberg Bay, Cape of Good Hope

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Plough, the, Ursa Major

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Plover, great, and Norfolk, Thick-knee

Pluck, Pogge

Plumber's solder, Alloy

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Plym (r.), Dartmoor

Plymouth, Montserrat

Plymouth, Roanoke

Plymouth Bay, Massachusetts's Bay

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Podleys, Coal-fish

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Pobono Waterfall, Yo-Semite Valley

Point d'Alençon, Leos

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Pointers, the, Pole-star

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Polaris, Pole-star

Pole, Rod

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 Poudicherry kite, Erue
 Pond-snail, Limnea
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 Poon spars, Sterculiaceæ
 Poore, Cattle
 Poorhouse, Workhouse
 Poor man's herb, Gratiola
 Poor man's pepper, Cross
 Poornah, Berar
 Poor People of Lyon, Waldenses
 Poorundur, Poona
 Pop-corn, Maize
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 Port Dalrymple, Launceston
 Port Davey, Tasmania
 Port Douglas, Columbia, Brit.
 Port Dover, Erie, Lake
 Port-du-Bouc, Berre, Etang de
 Port Galo, Paxo
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 Port Hood, Cape Breton
 Port Hudson, U. S.
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 Portland, Oregon
 Portland Harbor, Weymouth
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 Prince's feather, Amaranth
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 Prince wood, Cordiaceae
 Prius glabri, Tea
 Prinsepia, Chrysobalanaceae
 Prionodon, Delundung
 Pripet (r.), Volynia
 Privas, Ardeche
 Privat-docent, University
 Privilege (in parliament), Parliament
 Broboilinggo, Java (Supp.)
 Proboscis seal, Elephant, Sea
 Procellaria, Petrel
 Proclis, G. da, Sicilian Vespers
 Proclentia, Worm, Diseases of
 Procopina, Valens
 Proctalgia, Rectum
 Proctor, General, U. S.
 Product, chemical, Edict
 Professed houses, Monastery
 Proglottides, Tapeworm
 Prognathous cranium, Skull
 Prognostications, Almanac
 Prokopovitch, Russian Lang. & Lit.
 Pro-legs, Caterpillar
 Prolocutor, Convocations
 Prolok, Mount, Dinaric Alps
 Proma, Pegu
 Pronation, Hand
 Proof-spirit, Alcohol
 Propeller, Nautilus Propeller
 Propensities, Pneurology
 Property, real, Rent
 Propontis, Marmora, Sea of
 Prohyphyctes, Alcohols
 Prorogation, Parliament
 Proscenium, Theatre
 Proscenephalon, Skull
 Prosopopeia, Personification
 Prospero Lambertini, Benedict
 Prothorax, Insects
 Protopterus, L-phosiren
 Protoxide, Oxides
 Provencal, Romantic Lang.
 Proventriculus, Birds
 Prover, Approver
 Prowe, Slaves
 Proxies, (in parliament), Parliament
 Prud'hou, Painting
 Puritus, Rectum, Anna
 Prusa, Brussa

Prussia, Germany
 Prussia, education in, National Education
 Prussian carp, Gibel
 Psalms of the Steps, Gradual Psalms
 Psalterium, Digestion
 Pseudonymous, Anonymous
 Pseudopodia, Rhizopoda
 Pseudo-scorpions, Chelifer
 Psilia, Carrot
 Psyllorith, Ida
 Psokoff, (I.), Pelpus
 Psosus, Termite
 Psophia, Agami
 Psophia, Arcadia
 Psora, Itch
 Ptah, Egypt
 Pielea, Epheus
 Pteris, Brake, Tara Fern
 Pteroglossus, Aracadi
 Ptiloris, Rifle-bird
 Pilsan, Tisan
 Ptyaline, Digestion
 Ptyalism, Salivation
 Puberty, legal, Age
 Pubes, Pelvis
 Publicans, Cathart
 Public health, Sanitary Science
 Publilian laws, Rome
 Publishing, Book-trade
 Puccoon, Sanguinaria
 Pucha-pat, Patchouli
 Puck, Fairies
 Pudding-pipe tree, Cassia
 Puddling, Iron
 Puebla, Juarez
 Puffinus, Shearwater
 Puget-Thieners, Alpes Maritimes
 Pughe, Owen, Welsh Lang. & Lit.
 Puglia, Apulia
 Puglia, Francesco da, Savonarola
 Pug-mill, Brick
 Pulcinella, Punch
 Pulmonaria, Arachnida
 Pulmonary artery and veins, Respiration
 Puleatilla, Pasque Flower
 Pulteney-town, Wick.
 Pulu-Buru, Amboyus
 Puna, Poona
 Punching-machine, Punch
 Punctated tissue, Wood and Woody Fibre
 Punjab, Chenab, Punjab
 Puno, Ecuador
 Punos, Venezuela
 Punta Arenas, Costa Rica, San Jose
 Punto, Quadrille
 Punt, Glass
 Popularity, Age
 Pupipara, Homaloptera

Pur autre vie, Estate
 Purbach, Almanac
 Puri, Jaggernaut
 Purna (r.), Gomrawutti
 Purnabada (r.), Dinagapora
 Purples, the, Purpura
 Purple, Color (her.)
 Purree, Indian Yellow
 Pursa, Ray
 Pursuk (r.), Kutsaleh
 Purus (r.), Amazon, Peru
 Purveal (I.), Finland
 Pushtaneh and Pushts, Afghanistan
 Pusterthal, Tyrol
 Putcoli, Campania
 Putten, Holland, South
 Putting-nets, Frawn
 Pu-tu, Chusan Islands
 Putumayo (r.), Amazon
 Puy-de-Sancy, Dor
 Puy-Vieux, Mont de, Vienne, Haute
 Pwllheli, Caernarvonshire
 Pycnonotus, Bulbul
 Pydna, Macedonia
 Pydna, battle of, Scipio Emilianus
 Pygmalian, Tyro
 Pyhäjärvi (I.), Finland
 Pyloe, Messenia
 Pyramus (r.), Zeithun
 Pyrethrum carneum, Persian Powder
 Pyrgita, Sparrow
 Pyroxyline, Collodion
 Pyrrhic foot, Pyrrhic Dance
 Pyrrhata, Bull-finch
 Pyrus Japonica, Quince
 Pyeang, Moluccas
 Pythias, Damon
 Pythogenetic fever, Typhus & Typhoid Fevers.

Quade, Grane
 Quadi, Silesia
 Quadrantes, Rose-noble
 Quadrat, Type
 Quadrequivalent elements, Triads
 Quaker bird, Albatross
 Quality, in logic, Quantification of the Predicate
 Quantity, in logic, Quantification of the Predicate
 Quantity, in verse, Rhythm
 Quantock Hills, Somersetshire
 Quarnero Bay, Adriatic Sea
 Quarry, Falconry
 Quarter evil, Black Quarter
 Quarter-pieced, Square-pieced
 Quarto, Book
 Quartz resinite, Girasol
 Quartz, smoke, Rock-crystal
 Quaternate, Leaves
 Quathamba, Kaffraria

- Quathlamba (mts.), Natal, Orange
 River Free State
 Quebec, Canada
 Queen Elizabeth's Foreland, Frobiisher,
 Sir M.
 Queensberry (mt.), Dumfriesshire
 Queen's cadets, Sandhurst
 Queen's coroners, Queen's Bench
 Queen's conch, Cameo
 Queen's ware, Wedgwood
 Quelch (r.), Bavaria, Landau
 Queipaeria, Oorea
 Quercine, Oak
 Quercite, Sugar
 Quercus ballota, Racahout
 Quercus tinctoria, Quercitron
 Querquedula, Teal
 Question, the, Torture
 Quetsch-Hahn, Volumetric Analysis
 Queyles (r.), Tarazona
 Quick grass, Bent Grass
 Quicks or quicksets, Hawthorn
 Quida, Scandinavian Lang. and Lit.
 Quleto, Kusterland
 Quiloa, Muscat
 Quilun, Cluchoua
 Quilate, Leaves
 Quinic acid, Kinic Acid
 Quinidine, Quinia
 Quinidine, Quinia
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 Quinolone, Dye-stuffs
 Quinquina, Cluchoua
 Quinte, Bay, Ontario
 Quippo, Writting
 Quipu, or Quippu, Peru
 Quirinal, Quirinus
 Quiriquino (i.), Concepcion
 Quirites, Rome
 Quiver, Archers
 Quoad sacra, Parish
- Ra, Ammon
 Raab (r.), Alps
 Rabato, Gozzo
 Rabbath-Ammon, Ammonites
 Rabbets, Shipbuilding
 Rabe, Martha, Catherine I.
 Race, Cape, Newfoundland
 Rachelberg, Bavaria
 Rachitis, Rickets
 Rack, Arrack
 Radagaisus, Stilicho
 Radane, Danzig
 Raddle, Reddle
 Radegast, Slaves
 Radularia, Zoophyte
 Radicle, Seed
 Raditshevitz, Servia
 Radius, Hand -
 Ræ Isthmus, Melville I.
- Raffaello Santi, Raphael
 Raft-bridge, Bridge, Military
 Rafue (r.), Zambesi
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 Ragatz, Pfeffers
 Rage, Emotion
 Ragged Robin, Lychnis
 Ragnarök, Scandinavian Mythology
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 Rahad, Nile
 Rahajan (r.), Borneo
 Rain, Ray, Thornback
 Ralatea, Coral Is., Society Is.
 Rala torpedo, Electricity, Animal
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 Raim, Caniking
 Rain-doctors, Betjuans
 Rajagriha, Bahar
 Rajasthan, Rajpoots
 Rajmahal Hills, India
 Raki, Arrack
 Rakick Islands, Radack
 Ramee, Beshmeria
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 Ram feast, Belteln
 Ramgunga (r.), Budaon
 Ramler, Mount, Washington (territory)
 Ramisseram, Manasar, G. of
 Ramonggur, battle of, Sikh Wars
 Rampe, Rampion
 Rampur, Rohilcund
 Rampura, Indore
 Ramree, Aracan (prov.)
 Ramses, Ramesses
 Ramsons, Allium
 Ram-turnai, Ilbiscus
 Ranay, Natuna Is.
 Rance (r.), Côte-du-Nord
 Rank, relative, Relative Rank
 Ransome, Frederick, Stone, Artificial
 Rapaces, Accipitres
 Rape, Riding
 Raphoe, Adamnan
 Rapperschwyl, Gall, St. Canton of
 Rapti (r.), Ghogra, Oude
 Raratonga, Cook Is.
 Ras, Abyssinia
 Ras Mohammed, Red Sea
 Rasores, Gallinaceous Birds
 Rat Islands, Aleutian Is.
 Rata, Inocarpus
 Ratamanow, Diomedea Is.
 Ratan, Rattan
 Ratanhia, Rattany
 Rathdrum, Wicklow
 Rathmelton, Donegal
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- Rattenlug, Trades' Unions
 Rattles, Respiratory Sounds
 Rattlesnake fern, Botrychium
 Rattoons, Sugar-cane
 Ratzeburg, Lauenburg, Mecklenburg-Strelitz
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 Raunthaler, Rhine-wine
 Raves or Ravi (l.), Chenab, Punjab
 Ravensala, Traveller's Tree
 Ravensbourne, Deptford
 Rawtenstall, Newchurch
 Ray, Cape, Newfoundland
 Ray-grass, Rye-grass
 Raymond VI. and VII. Counts of Toulouse, Albigeneses
 Rays of fins, Fishes
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 Rea, Râi
 Rea (r.), Birmingham
 Read, Gabriel, Otago
 Real distance, Vision
 Reate, Rieti
 Rebaptisers, Raskolnik
 "Rebecca" riots, Caermarthenshire
 Rebelra Grande, Azores
 Recercele, Cercelée
 Reciprocal proportion, law of, Atomic Theory
 Recognition, Wardholding
 Record of Title Office, Incumbered Estates
 Recrementitious products, Secretion
 Recruiting, War Services
 Rectified spirit, Alcohol
 Rectus muscle, Patella
 Reculet de Tolry (mt.), Jura
 Red bird, Cardinal Bird
 Red-breasted goose, Barnacle Goose
 Red charcoal, Charbon Rouge
 Red dog, Dhole
 Red flames, Sun
 Redif, Turkey
 Redl, Signals
 Red lead, Red Colors
 Red-legged crow, Chough
 Redon, Ille-et-Vilaine
 Redondillas, Spanish Lang. & Lit.
 Red River Settlement, Canada
 Red-tailed Hawk, Buzzard
 Reed, Ruminantia
 Reed (r.), Tyne
 Reed-bird, Bob-o-link
 Reed-mace, Bulrush
 Reed meadow grass, Manna Grass
 Reedy sweet water grass, Manna Grass
 Reek, the, Westport
 Reel, Spinning
 Reel, angler's, Angling
 Reeve, Ruff
 Referee, Arbitration
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 Reformed Franciscans, Recollet
 Refrigeratory, Still
 Regallm, Seven
 Regen (r.), Bavaria
 Reggio, Duke of, Oudinot
 Regina, Juno
 Regj Lagni, Acerra
 Regnier, Satire
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 Reiser work, Bull-work
 Rejang (r.), Sarawak
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 Rens, Glommen
 Rennel's current, Biscay, Bay of
 Rennet, Ruminantia
 Rental holls, Teinds
 Reo, Salmon
 Repeating circle, Sextant
 Repeating guns, Revolver
 Republican Fork, Nebraska
 Rescript, Pragmatic Sanction
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 Reshid Pasha, Abd-ul-Medjid-Khan
 Residual, Congruous
 Resist style, Calico Printing
 Resort (l.) Lewis-with-Harris
 Responsibility, Belief
 Restitution edict, Thirty Years' War
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 Reticulum, Ruminantia
 Retinute, Trap
 Retort, gas, Gas
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 Retrone (r.), Vicenza
 Retroversion, Womb, Diseases & Derangement of the
 Retting, Flax-dressing
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 Reuse, Neufchatel
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 Rowand, Rhubarb
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Rhaladr Waterfall, Denbighshire
 Rhamuin, Buckthorn
 Rhamphorhynchus, Pterodactyl
 Rhanzes, Medicine, Hist. of
 Rhea Silvia, Romulus
 Rheidol, Cardiganhire
 Rhefu, Rhubarb
 Rheueck, Rhine
 Rheinpreussen, Rhenish Prussia
 Rheinprovinz, Rhenish Prussia
 Rhein-Zabern, Zabern
 Rhenus, Rhine
 Rheostat, Galvanism
 Rheum, Rhubarb
 Rhinencephalon, Skull
 Rhins of Galloway, Wigtown
 Rhion, Cape, Etolia
 Rhippei Montes, Ural Mts.
 Rhipiptera, Strepsiptera
 Rhithymus, Candia
 Rhizocarpeæ, Marsileaceæ
 Rhizomes, Carex
 Rhizophagon, Truffle
 Rhodanus, Rhone
 Rhodéz, Aveyron
 Rhonchus, Respiratory Sounds
 Rhönggebirge, Bavaria, Saxo-Meiningen
 Rhun, Moluccas
 Rhus, Sumach
 Rhyddlan, Flintshire
 Rhyme, Rhyme
 Rhymney, Cardiff
 Rhynchaapis, Shoveller
 Rhynchites, Weevil
 Riad, Wahabis
 Rialto, Isola di, Venice
 Ribalta, Francesco, Ribera
 Ribbing, Count, Aukarström
 Ribble, Lancashire
 Ribbon grass, Canary Grass
 Ribchester, Preston
 Ribeira Grande, St Michael's
 Ribes, Gooseberry
 Ribe, Ship-building
 Rice bird, Bob-o-link
 Rice weevil, Corn Weevil
 Richardia, Calla
 Richardson, Dr, Methylene
 Richebourg, Lillo
 Richelieu, Canada
 Richibucto, New Brunswick
 Richmond, Fr. Edward's I.
 Richmond (r.), N. S. Wales
 Richmond, Earl of, Tudor
 Ricimer, Rome
 Ricinla, or Ricinla, Rathlin
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 Riders, Wall-trees
 Rieselstock (mt.), Schwyz
 Rifled arms, War Services

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 Right-boys, Whiteboy
 Rights of Man, Paine, T.
 Right whale-porpoise, Delphinaptera
 Rille, Orne
 Rimi, Eriodendron
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 Rim stock, Clog Almanac
 Rinaldo, Armida
 Rind, Junna
 Rinderpest, Cattle-plague
 Ringed snake, Coluber
 Ringtail, Harrier
 Rink, Curling
 Rinman's Greeu, Cobalt
 Rinn, Lough, Leitrim
 Rio Coco, Nicaragua
 Rio d'Aveiro, Aveiro
 Rio del Monte, Tagus
 Rio del Rey, Biafra
 Rio de Senna, Soala
 Rio Dulce, Golfo Dulce
 Rio Grande, Texas
 Rio Grande de Lerma, Chapala
 Rion, Phasla, Poty
 Rios di Senna, Zambezi
 Rio Tinto, Moguer
 Rippling, Flax-dressing
 Rissil, Lille
 Ritardando, Lentando
 Riva, Tyrol
 Rivas, Nicaragua
 River limpet, Limnea
 Rivera, Mr, Orchard-house
 Rivesalt, Muscatel
 Rive saites, Pyrenees Orientales
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 Rjev, Rahew
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 Roag (l.), Lewis-with-Harris
 Roanne, Loire
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 Robertina, Sorbonne
 Robin, Redbreast
 Robusti, Jacopo, Tintoretto
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 Rochambeau, Count de, U. S.
 Rochechouast, Vienne, Hauts
 Rock, Spinning
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 Rocket, dyer's, Weld
 Rockets, Life-mortars &c.
 Rock-fish, Bassæ
 Rockhampton, Queensland
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- Rock manakin, Rock, Cock of the
 Rock-rose, Cistus
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 Rock-snake, Bugar, Python
 Rock-wood, Asbestos
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 Rodger, Andrew, Fanners
 Rodling (r.), Essex, Thames
 Rodman gun, War Services
 Rodna, Transylvania
 Rod of Aaron, Divining Rod
 Rodolf, Rudolf
 Rodriguez, Island of, Solitaire
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 Roebuck, Dr. Watt
 Roer (r.), Maas, Roermond
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 Rogenia, Whitebait
 Rogers, Professor, America
 Rogues' Novei, Spanish Lang. & Lit.
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 Rom, Gypsies
 Romaic Greek, Greece
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 Roman candle, Pyrotechny
 Romance languages, Romanic Lan-
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 Romanche, Icere
 Romano, Giulio Pippi
 Roman order, Roman Architecture
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 Romanus II., III., IV. Byzantine Em-
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 Romerswaal, Beveland
 Romney, America, Owen, Robert
 Romni, Moldavia
 Romulea, Bisaccia
 Ronan, Adamau
 Ronas Hill, Shetland
 Ronay, Skye
 Roncal, Navarre
 Rönne, Bornholm
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 Roodpeer, Phoberos
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 Roopneruin, Dalkiesore
 Root (r.), Racine (town)
 Root, crown of the, Stem
 Roper (r.), Australian Explorations
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 Rosa Maria, Rose of Jericho
 Rosamond, Albion
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 Rosas Bay, Catalonia
 Rose, Rev. Hugh, Tractarianism
 Rose apple, Eugenia
 Rose bay, Oleander
 Roseberry Topping Hill, Cleveland
 Rose-chaffer, Turnip
 Roseline, Dye-stuffs
 Rose laurel, Oleander
 Rosemary, Dampier Archip.
 Rosemary, Marsh, Statice
 Rosencrauz, General, U.S.
 Roseneath, Dumbartonshire
 Rosenkrenz, Father, Rosicrucians
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 Rose-point, Lace
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 Rosette, Leaves
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 Rosoglia, Orange
 Rosolic acid, Tar
 Rosalario Point, Wexford
 Rosso antico, Trap
 Rosoli, Sundew
 Ros solis, Sundew
 Rothay (r.), Windermere
 Rotheuburger, Rhine-wine
 Rother (r.), Don, Yorkshire
 Rother (r.), Midhurst
 Rothschild, Almaden
 Rotomagus, Rouen
 Rotorua (l.), New Zealand
 Rottang, Rattan
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 Roumpot, Scheldt
 Roundels, Besants
 Round-tail, Bull-trout
 Round Top (mt.), Appalachians
 Rovigo, Duke of, Savary
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 Rowsa, Ronsay
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- Royal Canal, Westmeath
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 Roy Bareilly, Oude
 Roymatia, Calcutta
 Royston, Cambridgeshire
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 Rubble, Brash
 Rubellite, Tourmaline
 Rubeola, Measles
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 Ruby, Almandine, Spinel
 Ruby, Bohemian, Rose-quartz
 Ruby-tailed flies, Chrysids
 Rudnik Mts., Servia
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 Rudolphine Tables, Rudolf II.
 Ruféa, or Rufá (r.), Alpheius
 Ruffec, Charente
 Ruffed grouse, Bonasia
 Ruffallic acid, Gallic acid
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 Ruglen, Rutherglen
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 Rule, St. Andrew, St.
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 Rumonsh, Romanic Languages
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 Rumuni, Austria
 Ruu, Victoria
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 Runstuffs, Almanac
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 Rapicola, Rock, Cock of the
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 Ryots, Oude
 Ryssen, Overysel
 Rytina, Stellerine
 Sa, Sals
 Saabs, Africa
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 Saalfeld, Saxe-Meiningen
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 Sadang (r.), Sarawak
 Saddle Peak, Sierra Nevada
 Sadeler, Engraving
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 Saffron, bastard, Safflower
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 Sagoekin, Russian Lang. & Lit.
 Sahel, Algeria
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 Sal, Cebus
 Salan (mts.), Irkntsk
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 Sail-sons-Couzan, Lolre
 Salma (l.) Finland
 St Agnes, Scilly Islands
 St Alban, Loire
 St Alban, Vermont
 St Alban's Head, Dorsetshire
 St Andeol, Ardeche
 St Anne (i.), Seychelles Is.
 St Anthony's Fire, Rappania
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 St Bel, C. V. de, Veterinary Medicine
 St Bride's Bay, Pembrokeshire
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- St Colme, Lords, Stewart Family
 St Colum-cill, Columba
 St Cuthbert's duck, Elder
 St Denis, Bourbon, Ile de
 Ste Amponle, La, Rheims
 Ste Claude, Jura
 St Edmundsbury, Bury St Edmunds
 St Elmo, Point of, Valetta
 Ste Marie, Nossi-Ibrahim
 Ste-Menehouki, Marne
 Ste-Reine, Alesia
 St Francis, Canada
 St Francis Bay, Cape of Good Hope
 St Galmics, Loire
 St George, Grenada
 St George's Newfoundland
 St George's (r.), Salina
 St Girons, Ariège
 St Helen, Mount, Washington (territory)
 St Helen's Beds, Osborne Beds
 St Helen's Roads, Wight, Isle of
 St Hubert dog, white, Talbot
 St Jacques, Cape, Saigon
 St Jago di Compostella, Galicia
 St Jean de Luz, Pass of, Pyrenees
 St Jean de Maurienne, Savoy
 St Jean Pied du Port, Pass of, Pyrenees
 St John, Cape, Staten Island
 St John, H., Bollingbroke
 St John (r.), Kaffaria
 St John Long's Huiment, Turpentine
 St John's (l.), America
 St John's (r.), New Brunswick
 St Jorgo, Azores
 St Julian, Savoy
 St Kitta, Christopher's, St.
 St Leonard's Forest, Sussex
 St Louis, Nossi-Ibrahim
 St Louis (r.), Lawrence, St (r.)
 St Louis (r.), Superior, Lake
 St Lucia (r.), Zululand
 St Marcelin, Isère
 St Margaret's Bay, Nova Scotia
 St Margaret's Hope, Forth, Firth of
 St Mark, Grenada
 St Martha wood, Brazil Wood
 St Martin, Ré, Ile de
 St Martin's, Scilly Islands
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 St Mary, Azores
 St Mary, Lawrence, St (r.)
 St Mary's, Newfoundland
 St Mary's Scilly Islands
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 St Myou, Puy-de-Dôme
 St Patrick, Grenada
 St Paul (l.), Amsterdam I.
 St Pauls (l.), Lawrence, St, G.
 St Peter's Bay, Pr. Edward's I.
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 St Pierre, Hill of, Maastricht
 St Pietro di Brazza, Brazza
 St Pol, Pus-de-Calais
 St Sauveur, Pyrenees, Hautes
 St Sebastian's Bay, Cape of Good Hope
 St Sever, Landes
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 St Thomas, U.S.
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 Salsang (l.), Siberia
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 Sakáyi-el-Kublee, Berenice
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 Sal, Cape Verd Islands
 Sal, Don
 Salar, Salmon
 Salarias, Leaping Fish
 Salsal, Aosta
 Salawatti, Papua
 Salcombe Hill, Sidmouth
 Salduba, Saragosa
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 Salem, Oregon
 Salembria (r.), Trikhala
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 Salisbury Crags, Arthur's Seat
 Salle, Abbé de la, Schools, Brothers of Christian
 Salmalia, Silk-cotton
 Salmon peel, Salmon
 Salou (r.), Aragon
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 Saleilla, Alstromeria
 Salso (r.), Sicily
 Salsola, Belvedere
 Salsolaceæ, Chenopodiaceæ
 Salt (l.), Holyhead
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Saltance, Natron
 Salter's balance, Spring Balance
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 Salt oil, Bittern
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 Salween (r.), Tenasserim
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 Salzburcher Head, Nazeau
 Samailov, Russian Lang. & Lit.
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 Sambre (r.), Maas, Namur
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 San Antonio, Cape Verd Is.
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 Sanders, Sandal-wood
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 Sand Head, N. & S. Goodwin Sands
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 Sandoway, Arcan (prov.)
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 Sand ray, Homelyn
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 Sandwich Harbor, Namaqualand
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 Sandy Point, Christopher's, St
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 Sangar Strait, Yesso
 San Germano, vapor baths of, Agnano
 San Giallano, Monte, Sicily
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 San Ignacio de Agaña, Ladrone
 San Jacinto, battle of, Texas
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 San Juan (i.), Fuca, Strait of
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 San Pietro (i.), Sardinia, I. of
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 Saunhar, Dumfriesshire
 San Ramon, Fort, Andes
 San Roque (r.), Columbia
 San Salvador, Bahamas
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 San Sebastian, Cape, Catalonia
 Sansevera, Bowstring Hemp
 Santa Anna de Tamaulipas, Tampico
 Santa Casa, Loretto
 Santa Clara, Claire, St
 Santa Croce (mt.), Cyprus
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 Santa Cruz, Patagonia
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 Santander, New Granada
 Santa Rosa, Cahulla
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 Sao Jose do Norte, Rio Grande do Sul
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 Saparoua, Moluccas
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 Sapor, Sassanide
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 Sappare, Cyanite
 Sappho's Lean, Encato, C.
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Sarn, Moonjah
 Sarabite, Monachism
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 Savili, Navigator's Is.
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 Save (r.), Garonne
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Saxe-Wittenberg, Saxony
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 Sayan, Chay Root
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 Sclaria, Wentletrap
 Scala Santa, Lateran
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 Scandia, Scandinavia
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 Scapa Flow, Pomona
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- Schoolmen, Scholastic
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 Scotus, Marianne, Ireland
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 Scurvy grass, Cress
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 Scythian lamb, Barometz
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 Sea-calf, Seal
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- Sebona Wady, Nubia
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- Shachovski, Russian Lang. & Lit.
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 Solfa, Tonic, Tonic Solfa
 Solidor, Port, St. Servan
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 Solis, America
 Solis, Spanish Lang. & Lit.
 Solimona, Sulmona
 Sologne, Loiret
 Solohnb, Connt, Russian Lang. & Lit.
 Solos, Quolts
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 Sommeiller, M., Tunnel
 Sommer's Isles, Bermudas
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 Souderborg, Alsen
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 Sondeli, Musk Rat
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 Souguine, Castel-Sarrasin
 Sonnachees, Africa
 Souueburg, Saxe-Meiningen
 Sonoma, California
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 Soothers, Caste
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 Soothing syrups, Narcotics
 Sooty tern, Egg-bird
 Soph, Cambridge University
 Sora rail, Crane
 Sorata, Nevado de, Andes
 Sorb, Beam-tree
 Sorbin or Sorbite, Sugar
 Sorbs, Saxony
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 Sorghum, Broom-corn
 Sorgo, Sugar-cane
 Sorgue, Affrique, St.
 Sorrel, salt of, Oxalis
 Sorrel cool drink, Hibiscus
 Sosil, Book-trade
 Sosna, Birlontché, Don, Orol
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 Soto, Ferdinand de, U. S.
 Soubise, Huguenots, Seven Years' War
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 South-east Cape, Papua
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 Soutso, P. and A. Greece
 Sowans, Oats
 Sowbread, Cyclamen
 Spadille, Quadrille
 Spagnoletto, Ribera
 Spalding Club, Roxburghe Club
 Span Head, Exmoor Forest
 Spanish Black, Cork
 Spanish Head, Man, Isle of
 Spanish March, Spain
 Spanish plum, Hog Plum

Spanish wool, Carmine
 Sparling, Smelt
 Sparring-matcher, Pugilism
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 Spasmodic croup, Thymus Gland
 Spat, Oyster
 Spearwort, Ranunculus
 Specific heat, Heat
 Speckled wood, Palmyra Wood
 Spectacle snake, Cobra da Capello
 Spectator, Addition
 Specton clay, Cretaceous Group
 Spectre-caudles, Belemnites
 Specular cast-iron, Krupp's steel
 Specularia, Venn's Looking-glass
 Speightstown, Barbadoes
 Spelter solder, Alloy
 Spencer, magazine rifle, Breech-Load-
 ing Arms
 Spent-fish, Salmon
 Sperchens, Greece
 Spergula, Spurrey
 Spermatozoon, Vertebrata
 Spermodern, Seed
 Sperm whale, Cacholot
 Sphargis, Turtle
 Spheniscus, Penguin
 Spherical case, Case-shot
 Sphincter ani, spasm of the, Anus
 Spice-wood, Benzoin
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 Spikeard, oil of, Grass Oil
 Spina, Circus
 Spinach, mountain, Orache
 Spinal ice-bags, Sea-sickness
 Spindle, Spinning
 Spinifex, Australian Explorations
 Spinneret, Silk & Silkworm, Spider
 Spinning-jenny, Spinning
 Spinola, Genoa
 Spires, Speyer
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 Spirling, Smelt
 Spirting cucumber, Elaterium
 Spital, Hospitals
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 Splenic corpuscles, Spleen
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 Sponge, Bread
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- Spotted fever, Typhus & Typhoid Fevers
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 Spring-buck, Prong-horn
 Springfield ant, Hickory
 Spring-guns, Trespass
 Spring herring, Alewife
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 Sprits or Sprots, Rnsh
 Spruce partridge, Gronse
 Spunkie, Iguia Fatuus
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 Stalking-horse, Wild-fowl
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 "Stamping-out," Cattle Plague
 Stanchio, Cos
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 Starch, patent, Rice
 Stargard, Mecklenburg-Strellitz
 Starker, Mr., Embossing
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 Stavro Vnno (mt.), Cyprus
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- Stille (r.), Schmalkalden
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 Stoddart, Col. Bokhara
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 Stonyhurst, Lancashire
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 Strathavon, Banffshire
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 Stratus, Clouds
 Straw, Jack, Tyler Insurrection
 Strawberry bilte, Chenopodiaceæ
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 Stubbekjøbing, Falster
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- Suctoria, Annelida
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 Sweet calabash, Granadilla
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 Sweet locust, Honey Locust Tree
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 Sweet woods, decoction of, Sarsaparilla
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- Symphoria or Symphoricarpus, Snow-
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- Tarentella, Tarantism
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- Troitzko-Savsk, Irkutsk
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- Turpe, Prints
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- Uria, Gulllemot
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 Walker, Engraving
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 Water-hemlock, Water Drop-wort
 Water-hog, Capybara
 Water hog-louse, Asellus
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 Waterlanders, Anabaptists
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 White flux, Tartaric Acid
 White Hills, Appalachians
 White Horse Hill, Berkshire
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 White Inlet, Newfoundland
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